Competitiveness of the EU egg sector, base year 2021

International comparison of production costs of eggs and egg products

P.L.M. van Horne, N. Bondt

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This research has been commissioned by the EU trade associations EEPTA (European Egg Packers and Traders Association) and EEPA (European Egg Processors Association).

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Companies in the European Union egg sector have to comply with European legislation on animal welfare, food safety and environmental protection. Whereas the legislation aims to guarantee a high quality poultry production, it also confronts the sector with extra costs. Countries outside the EU do not have the same extensive legislation. This report presents the results of a study on the competitiveness of the EU egg sector. The production costs for eggs and egg products are calculated for several EU and third countries. Different scenarios are outlined to illustrate the impact of changes in import levies and exchange rates.

Key words: competitiveness, eggs, egg powder, production costs, international trade, EU

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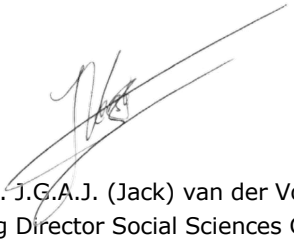
Preface

Companies in the European Union egg sector have to comply with European legislation on animal welfare, food safety and environmental protection. Whereas the legislation aims to guarantee a high quality product, it also confronts the sector with extra costs. An example of legislation is Council Directive 1999/74/EC regulating minimum standards for the housing of laying hens in enriched cages, barn and free range systems. Countries outside the EU do not have the same extensive legislation. At the same time the EU is involved in bilateral negotiations with different partners which are intended to further liberalise trade by reducing or abolishing import levies. This causes concerns within the EU egg sector regarding its competitiveness.

In this report Wageningen Economic Research, an independent research institute of Wageningen University & Research in the Netherlands, presents the results of a study on the competitiveness of the EU egg sector. The production costs for eggs and egg products are calculated for several EU and third countries based on the year 2021. Based on these data, different scenarios are outlined and their effects are calculated to illustrate the impact of lower levies and changes in exchange rates.

The study has been initiated and funded by the EU trade associations EEPTA (European Egg Packers and Traders Association) and EEPA (European Egg Processors Association). This report is an update of an earlier study for the year 2017 (van Horne, 2019).



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Summary

S.1 Key findings

In this report the impact of reducing or removing import levies on the competitiveness of the EU egg sector is studied, for both shell eggs and whole egg powder. As a result of the costs of transportation, import levies and the effects on product quality and safety, there will barely be imports of shell eggs from third countries to the EU. Competition from third countries is especially a threat when it comes to egg powder.

Current EU import levies on whole egg powder provide protection for the EU egg sector. In a scenario with 50% lower import levies, Ukraine (situation 2021) and the USA already have a lower offer price of whole egg powder compared to the EU egg sector. In a scenario with 50% lower import levies combined with a 10% lower exchange rate, all analysed third countries have a considerably lower offer price of whole egg powder compared to the EU egg sector.

The results for 2021 are presented in Figure S.1 and Figure S.2. Figure S.1 provides the production costs of whole egg powder in the EU, with the addition of transportation costs and the current import levies, compared to Ukraine, the USA, Argentina and India. Figure S.1 shows that import levies protect the EU from large volumes of imports from third countries. With the current import levies, the offer price of whole egg powder from all analysed third countries is above the offer price of EU producers.

Compared to the 2017 base line (van Horne, 2019) the EU offer price of eggs and egg powder increased. The offer price of the USA, Ukraine and Argentina showed a similar increase between 2017 and 2021. The result is an equal price difference with the EU. India showed a smaller increase in offer price, resulting in a slightly better competitive position towards the EU. The increase in production costs in all countries is mainly caused by higher feed prices.

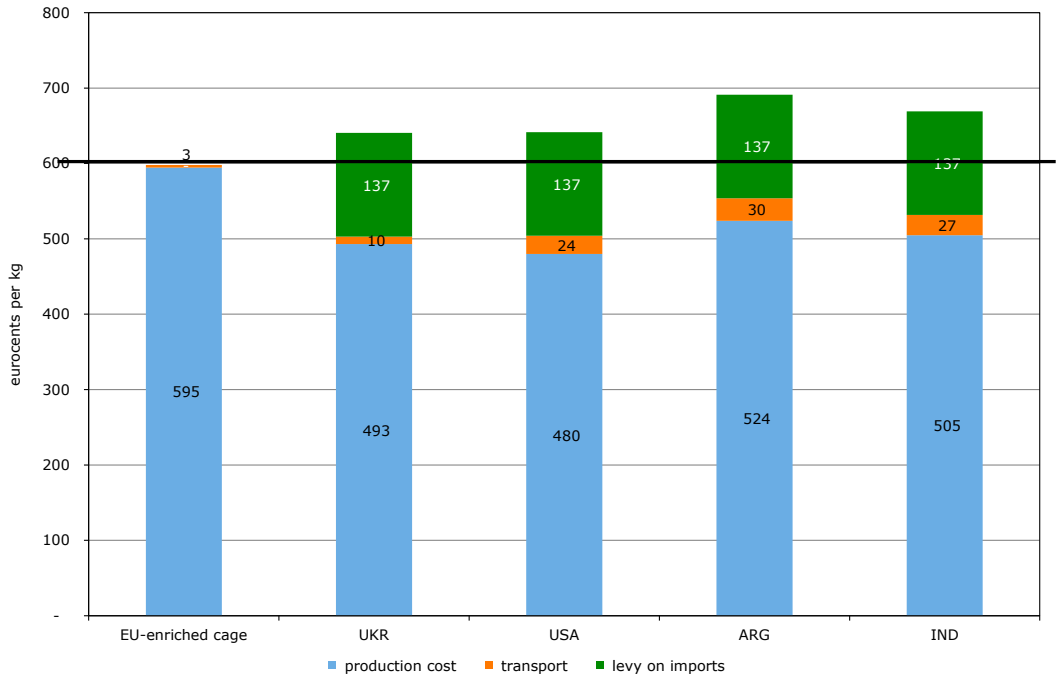

Figure S.1 *Offer price of whole egg powder in Germany from EU average (horizontal line) and analysed third countries (Ukraine, USA, Argentina, India) in eurocents per kilogram in 2021*

Figure S.2 illustrates the scenario with a 50% decrease in import levies and a 10% devaluation of the exchange rates for the non-EU currencies. In this situation all analysed third countries have a lower offer price of whole egg powder compared to the EU egg sector, and large volumes of whole egg powder can be expected to be imported from these countries. Offer prices in Germany could be 13% (Ukraine), 12% (USA) or 8% (India) below the average EU level.

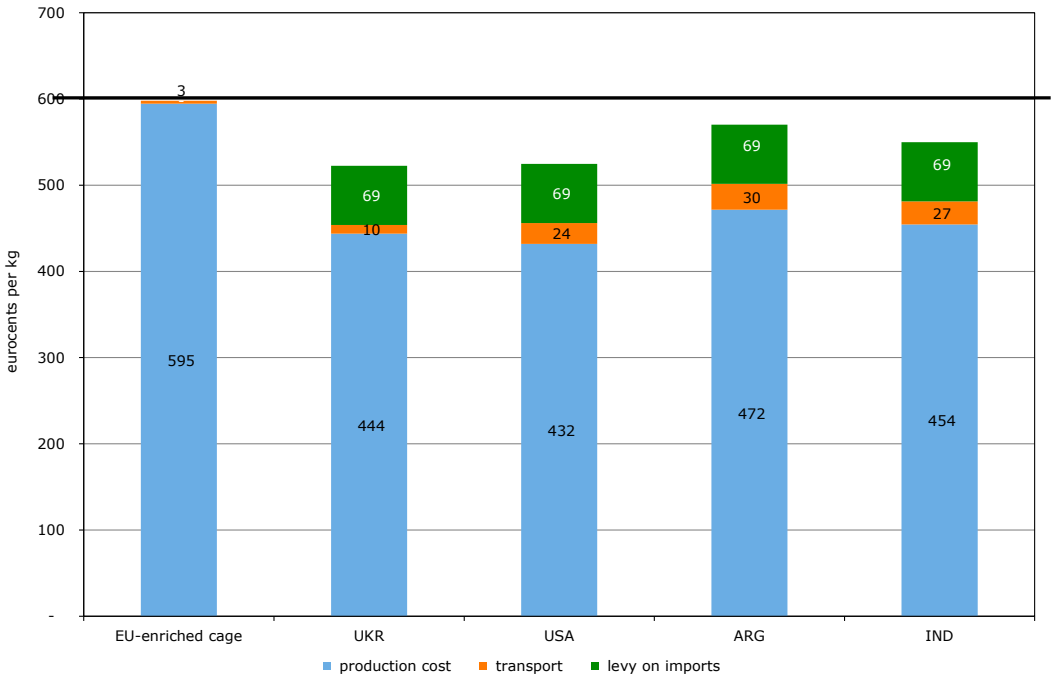

Figure S.2 *Offer price of whole egg powder in Germany from EU average (horizontal line) and analysed third countries (Ukraine, USA, Argentina, India) in eurocents per kilogram in 2021 based on scenario 3: 50% lower import levies and 10% lower exchange rate*

The 'worst-case scenario' consists of no import levies and a 10% lower exchange rate for the non-EU currency. In this scenario all analysed third countries would be very competitive suppliers of whole egg powder to the EU market. Offer prices in Germany could be 20% (India) to even 24% (USA and Ukraine) below the average EU level.

S.2 Complementary findings

The production costs of shell eggs produced in enriched cages in the EU in 2021 were on average 98.5 eurocents per kg of eggs. Between the main egg producing EU member states, the production costs of shell eggs in 2021 ranged from 100.6 eurocents per kg of eggs in Germany to 96.4 eurocents per kg of eggs in Poland. Compared to the average level within the EU, the production costs of shell eggs in 2021 were lower in USA (-21%), Ukraine (-19%), Argentina (-14%) and India (-15%).

For whole egg powder the analysed third countries were also competitive. Compared to the average level within the EU, the production costs of whole egg powder in 2021 were lower in USA (-19%), Ukraine (-17%), Argentina (-12%) and India (-15%). Because the cost of transportation of powder is low, the offer price of whole egg powder from third countries is relatively low. However, current import levies protect the EU from imports from the four analysed third countries.

In the EU, egg producers have to comply with European legislation on environmental protection, animal welfare and food safety. The additional costs directly related to European legislation are estimated to be 14%

of the total production costs of eggs at farm level in 2021. The extra costs of keeping layers in enriched cages account for a large share of these additional costs.

In Argentina, India and Ukraine there is no legislation on animal welfare and most laying hens are housed in conventional cages with a living area of 400 to 450 cm^2 per hen. Between countries, regions and farms the density differs due to climate and management strategy. Literature shows that from an economic point of view 350 to 400 cm^2 per hen gives the highest income for the egg producer. Table S.1 gives an overview of the regulations and political and societal interest of environmental, food safety and animal welfare issues in four selected non-EU countries.

Table S.1 *Regulation in selected non-EU countries (Ukraine, USA, Argentina and India)*

	Political and societal interest	**Regulations in place**	**Situation in practice**
Environment			
-Manure disposal	Medium	Differs a)	Most farmers receive revenues from manure
-Ammonia emission	Low	No	No measures taken to limit emission
Food Safety			
-Zoonosis control	Medium	Differs b)	Action different per country/company
-Meat and bone meal	Low	No	Meat and bone meal is used
-GMOs	Low	No	All GMOs are used
Animal Welfare			
-Stocking density	Low c)	No c)	High density in conventional cages

a) Regulations in some regions, for example in the USA; b) Regulations in some countries, for example in the USA or only export-oriented companies;
c) In the USA the market is changing towards non-cage eggs. Some states (e.g. California) already have some kind of legislation.

S.3 Methodology

Egg producers in the EU have to comply with legislation dealing with environmental protection, animal welfare and food safety. The result of all this legislation is an increase in the costs of producing eggs. At the same time the EU is negotiating with other countries or groups of countries to liberalise trade in agricultural products. In this report, Wageningen Economic Research studied the impact of reducing or removing import levies on the competitiveness of the EU egg sector.

The production costs of shell eggs and whole egg powder were calculated for eight EU egg-producing countries: the Netherlands, Germany, France, Spain, Italy, Poland, Denmark and Hungary and four non-EU countries: Ukraine, the USA, Argentina and India. In all countries data were collected on prices (feed, young hens), technical results (egg production, feed intake), investment (poultry house, cages) and other costs (interest rate, labour, manure disposal). For egg processing, data were collected on investment in buildings, equipment and labour costs. The base year for the data was 2021. The total costs were converted to euros with the average exchange rate in the year 2021. Account was taken of the implementation of enriched cages in the EU, being the minimum standard for egg production from 2012.

Based on the 2021 situation, four scenarios were developed:
- A 50% reduction in import levies for eggs and whole egg powder, to illustrate the result of a multi - or bilateral agreement of the EU with non-EU countries.
- A 10% lower exchange rate for the currency of the non-EU countries.
- A combination of a 50% reduction in import levies and a 10% lower exchange rate.
- A 'worst-case' scenario based on no import levies and a 10% lower exchange rate.

1 Legislation

1.1 Introduction

This chapter provides an overview of legislation in the EU. Poultry farmers and other food business operators in the production chain in the EU have to comply with this European legislation. This legislation is the translation of societal and political choices made in the EU and its standards and demands may exceed international standards and practices. Most EU legislation relates to environmental protection, animal welfare and food safety. Section 1.2 gives an overview of the most important legislation. Section 1.3 presents the additional cost of alternative housing systems for layers. Section 1.4 presents the economic impact of the legislation while Section 1.5 gives a short overview of the current situation of (animal welfare) legislation in some third countries. Although all links in the supply chain are confronted with legislation, this chapter mainly focuses on the situation and consequences at farm level.

1.2 EU Legislation

Egg producers in the EU have to comply with a set of European legislation. This legislation especially relates to environmental protection, animal welfare and food safety. In this section, EU legislation directly relevant to the egg sector is briefly presented. It should be noted that some Member States choose to go beyond EU standards by implementing more stringent national or regional legislation. This national legislation is not, or just briefly, discussed in this chapter. In a report of the European Parliament an overview is given of EU legislation related to the livestock sector (Chotteau et al., 2009).

Environmental protection
The EU has taken measures to limit the pollution of land, water and air. The main environmental legislation affecting poultry farms in the EU is the Nitrates Directive (91/676/EC). The Nitrates Directive aims to control pollution and protect water quality in Europe, by preventing nitrates from agricultural sources from polluting ground and surface waters and by promoting the use of good farming practices. The Nitrates Directive forms an integral part of the Water Framework Directive and is one of the key instruments to protect waters against agricultural pressures. The Directive has resulted in national action programmes to be implemented by farmers, such as limitation of fertiliser application and/or a maximum amount of livestock manure that can be applied per hectare per year (170 kg of nitrogen). Some countries have additional national environmental legislation to limit manure spreading to certain periods or specific soil types. This is especially relevant in areas with a high concentration of pigs and poultry, such as the south and east of the Netherlands, Flanders in Belgium, Bretagne in France, some parts of Denmark and Germany, Catalonia in Spain, and the Po valley in the north of Italy. Because of this legislation, poultry farmers in some of these regions have to pay for the disposal of manure (Van Horne, 2019).

In the EU, all poultry farms which exceed a threshold size of 40,000 bird places are requested through legislation to hold an environmental permit (Directive 2010/75). Operators are required to carry out activities in compliance with their environmental permit and they must use 'Best Available Techniques' (BAT) in order to achieve a high level of environmental protection (ADAS, 2016). The aim of the Directive is to apply the best available techniques to prevent or to reduce ammonia or other emissions to air, land and water from these activities, since pollution from poultry houses needs to be controlled. In Directive 2011/92 it is regulated that poultry farms need to have an Environmental impact assessment (EIA). This is required for all larger farms. Smaller farms may also require such an assessment at the discretion of the Member State. Often a fee is charged to cover the costs. The Directive also requires an odour or noise management plan in case of potential odour or noise complaints (Van Wagenberg et al., 2012). In addition, Directive 2001/81/EC gives National Emission Ceilings to ammonia emission for every Member State. Some Member States, such as the Netherlands and Germany, have additional national regulations to reduce ammonia emissions from poultry houses.

EU countries have to meet maximum limit values for certain substances to ensure air quality, following Directive 2008/50/EC. The Directive offers extension periods to comply with the maximum limit values based on conditions and the assessment by the European Commission. Several EU Member States will have to take measures to reduce emissions of fine dust from the most important sources, such as poultry houses, in which the dust arises from feathers, bedding material and manure (Aarnink and Ellen, 2008). National authorities can set emission standards for fine dust from poultry houses based on the BAT. Examples are the Netherlands and Germany with legislation for poultry farms to control the emission of fine dust.

Food safety
The European legislation on animal feed (e.g. Regulation (EC) No 183/2005) provides a framework to ensure that feedstuffs do not endanger human or animal health. The legislation sets rules on the circulation and use of feed materials, requirements for feed hygiene, rules on undesirable substances in animal feed, legislation on genetically modified food and feed, and conditions for the use of additives in animal nutrition. The consequence is higher costs for poultry feed. A large proportion of protein sources for poultry feed is imported from outside the EU. An increasing share of world production of soya crops is from genetically modified hybrids. The asynchronous EU approval of GM crops, coupled with the operation of almost zero tolerance, is negatively affecting the EU supply of feed ingredients (Backus et al., 2008), resulting in higher feed costs.

Foodstuffs of animal origin may present microbiological and chemical risks. Such risks require the adoption of rules of hygiene, traceability and labelling. For the egg sector, the Zoonoses Directive is especially relevant. Zoonoses Directive 2003/99/EC and Regulation 2160/2003 regulate sampling, monitoring and control measures. Between Member States, there is a large variation in Salmonella prevalence. In response to the European Food Safety Authority (EFSA) baseline study, each Member State had to make a plan to reduce the salmonella prevalence in laying flocks.

Animal welfare
All Member States have ratified the European Convention for animal protection with principles relating to animal housing, feed and care appropriate to their needs (98/58/EC). The aim is to prevent animals from all unnecessary suffering in three main areas: farming, transport and slaughter. Minimum standards are established to protect and to avoid competition distortions between producers in various Member States.

In the EU, all mutilation is prohibited (annex of Directive 99/74/EC). However, in order to prevent feather pecking and cannibalism, the Member States may authorise beak trimming provided it is carried out by qualified staff, on chickens younger than 10 days. Some countries have additional national legislation and ban any type of beak trimming.

Especially relevant for the egg sector is the welfare Directive 99/74/EC, laying down minimum standards for the protection of laying hens. The welfare Directive required that from 1 January 2003 the space allowance per hen in conventional cages increased from 450 cm^2 to 550 cm^2 per hen. From 2012, laying hens can only be kept in enriched cages or alternative (non-cage) systems. The enriched cage gives each hen 750 cm^2 surface area, increased cage height, a perch, a nest box and litter. Since this change towards enriched cages has large consequences for the sector, resulting in high additional costs, the impact of this Directive is discussed in Section 1.3.

1.3 Cost of alternative housing systems

The welfare Directive 99/74/EC required that from 1 January 2012 laying hens are housed in so-called enriched cages or in alternative (non-cage) systems. The alternative system described in the EU Directive most resembles the barn/aviary system. Different housing systems can be distinguished:

- Enriched cages
  In comparison to conventional battery cages the group size is enlarged. The enriched cage gives each hen 750 cm^2 surface area, increased height, a perch, a nest box and litter.
- Barn/Aviary systems
  This system is based on floor accommodation (comparable to barn housing) whereby via levels, the hens

can also use the vertical space in the house. Each hen has 1,100 cm^2 of usable area, part of the surface area of the house is covered with litter and in the house there are enough nest boxes and perches for the hens.

- Free range systems
  The housing is the same as for barn/aviary systems, but in free range systems, the birds have access to an outside range area (of at least 4 m^2 per hen), during daylight hours.
- Organic systems
  In organic systems the usable area per hen in the poultry house is larger than in free range systems. The outside area is minimum 4 m^2 per hen. Furthermore, in organic the 17 week pullets (additional rules in rearing) and feed (organic feed ingredients) are much more expensive.

To calculate the additional production costs of eggs we compare different housing systems: a conventional cage with 550 cm^2 per hen (as is still allowed in third countries), an enriched cage, the barn/aviary system, free range and organic. Based on results at research stations, field data of layer farms in different countries and expert opinions, assumptions were made on labour input and investments for enriched cages and barn/aviary, free range and organic systems. It is evident that increasing the space allowance per bird will lower the bird density per m^2 of poultry house. As a result, the investment for housing and equipment will increase. For the enriched cage and the barn/aviary, the labour needs and investments for house and equipment per hen place are higher. Table A3.1 in Appendix 3 provides the details.

Field data of layer farms show no major differences between the conventional and the enriched cage regarding egg production. In barn/aviary systems egg production is slightly lower and feed intake is higher than in the cage system. Table A3.2 in Appendix 3 gives the details.

The costs for housing and equipment are calculated for all housing systems. The other variable costs are also calculated for each system (electricity, litter, etcetera). Revenues spent hen are presented as negative costs. Table 1.1 provides the results. In enriched cages the costs are higher for other variable costs (because of the use of litter material), housing and labour. In the barn/aviary system all cost components are higher. In the enriched cage, the production costs compared to the conventional cage (with 550 cm^2 per hen) are 5% higher, in barn/aviary systems +21%, in free range systems +42% and in organic systems this is +125%.

Table 1.1 *Production costs for various housing systems for laying hens (situation North West Europe, prices 2021)*

	Conventional cage	Enriched cage	Barn/Aviary	Free range	Organic
Cost in euro per hen housed:					
Hen (pullet at 17 weeks)	4.29	4.29	4.73	4.86	7.25
Feed	16.01	16.29	17.11	16.61	26.78
Other variable costs	1.24	1.27	1.35	1.61	1.96
Housing	2.46	3.39	3.84	3.63	5.40
Outdoor area				1.04	1.15
Labour	1.32	1.41	2.47	3.74	7.20
General costs	0.39	0.42	0.66	0.99	1.72
Revenue spent hen	-0.29	-0.29	-0.38	-0.38	-0.45
Total cost	25.42	26.77	29.76	32.10	51.01
Total cost per egg (eurocent)	5.80	6.11	6.95	8.09	12.85
Total cost per kg (euro)	0.95	1.00	1.15	1.35	2.14
Increase (base 550 cm^2), %		5	21	42	125

The conclusion is that after implementation of EU Directive 99/74/EC, the housing system with enriched cages produces eggs at the lowest cost. Compared to the situation before 2012 (with conventional cages), the production costs of eggs are 5% higher. The production costs in aviaries are higher compared to enriched cages. This means the market price should be higher to keep the income for the egg producer at a constant level. As Table 1.1 shows, other alternative housing systems, such as free range and organic, have

substantially higher production costs than enriched cages and aviaries. Eggs produced in these systems need a much higher premium from the market to compensate the egg producer for the additional costs.

1.4 Economic impact of EU legislation

EU legislation and its implementation almost always results in additional costs for the poultry sector. Especially the layer sector is dealing with additional costs for environmental protection, animal welfare and food safety legislation. An estimate was made of the additional costs for the following aspects:

Environmental protection
- Manure disposal costs (as result of the Nitrates Directive).
- Reduction of ammonia emissions (at manure application, manure storage and in the poultry house).

Food safety
- Salmonella control. Cost of hygiene measures, collection of samples and testing, and vaccination.
- Meat and bone meal (MBM). There is no longer a ban on the use of meat and bone meal in the EU. However, there are still many restrictions resulting in higher costs compared to some countries outside the EU.
- Genetic Modified Organisms (GMO). The strict rules in the EU on the use of GMO crops results in higher feed costs.

Animal Welfare
- Beak trimming. Beak trimming of layers in the EU is only permitted up to 10 days of age. Compared to the situation without any legislation there can l be additional costs.
- Density. Additional housing costs for increasing the space allowance per hen from 450 cm^2 to 550 cm^2.
- Enriched cages. Costs of conversion from conventional to enriched cages with an increase in space allowance towards 750 cm^2.

In this study the costs were estimated for the year 2021 based on the average situation in the illustrated EU countries. The actual situation can differ per country or per region. Manure disposal costs are an example for this, with high costs in certain high poultry concentration areas and much lower costs in other regions, with a small number of poultry farms. Figure 1.1 provides all the cost components of the specific legislation. The additional costs directly related to EU legislation are 14% of the total production costs of eggs for the situation in 2021.

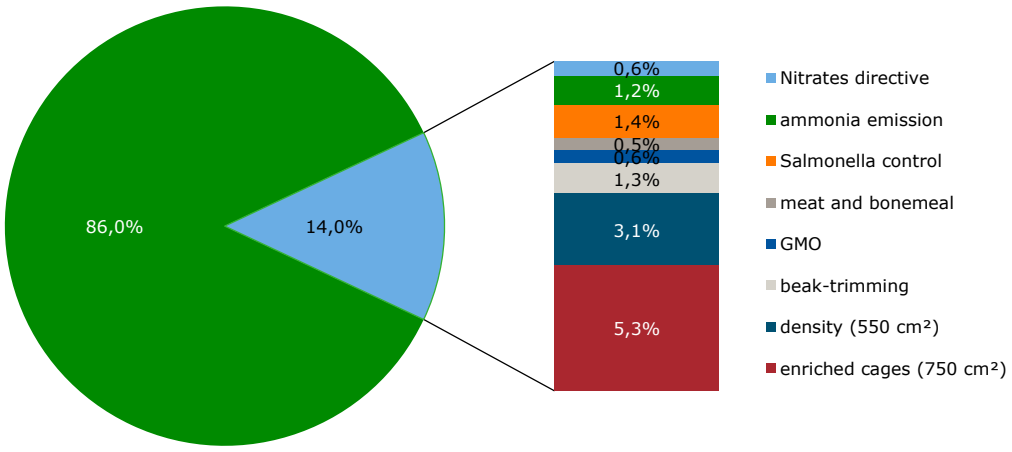

Figure 1.1 *Basic production costs (86%) and costs directly related to EU legislation (14%) in 2021*

Animal welfare legislation gives the largest increase in production costs. First, by increasing the space allowance from 450 cm^2 to 550 cm^2 in 2003, followed by the minimum standard with enriched cages (minimum 750 cm^2 per hen) in 2012. Other important legislation causing an increase in costs are environmental protection (reduction of ammonia emission) and Salmonella control.

Future EU and national legislation may further increase the production costs of eggs. The Member States have the competence to impose stricter rules for their territory in a number of areas. Additional legislation has already been implemented or will be implemented on several topics in the coming years. Examples are reduction of fine dust emission (Germany and the Netherlands) and a total ban on beak trimming (Germany and the Netherlands). Also noise reduction is an issue in some EU member states.

1.5 Situation in some third countries

Several reports give an overview of legislation in selected third countries. Van Wagenberg et al. (2012) extensively studied the standards on food safety, environment and animal welfare in several non-EU countries. A study at Wageningen University & Research (Bracke, 2009) focused on animal welfare regulations and husbandry standards in the poultry sector with special attention for the poultry sector in Brazil and the USA. Also, Van Horne and Bondt (2017) mapped the situation in the USA, India, Ukraine and Argentina in the egg sector. Lichter and Kleibrink (2016) did an extensive analysis on standards for poultry production in 16 important poultry-producing countries worldwide. ADAS (2016) made a comparison of regulatory requirement and key practices in the poultry meat supply chain in the EU and USA. This report gives an extensive overview covering the key areas of farm production systems and feed supply.

In general, non-EU countries do not have, or have limited legislation on environmental protection, food safety, and animal welfare. In some countries, for example the USA, the standards for food safety and animal health are considered by some to be equivalent to those in the EU. Nevertheless, standards between the EU and third countries do differ with regard to the type of veterinary drugs allowed and GMOs that are approved. Specifically for animal welfare, research shows that the EU standards are the highest in the world. No country outside Europe has such detailed and strict regulations to protect the welfare of poultry (Lichter and Kleibrink, 2016).

In most third countries, the standards for the environment and animal welfare are lacking, or the standards are lower than they are in the EU. These topics are not incorporated or only marginally incorporated into trade agreements. Internationally accepted conventions or standards exist for food safety (Codex Alimentarius), animal health and animal welfare (OIE), but do not exist for the environment. OIE codes are a recommendation to its members and the OIE has no power to force their members to follow the recommendations or standard laid down in the codes. Food safety and animal health are important aspects in negotiating and establishing trade agreements, but the environment and animal welfare are not or are not high on the agenda (Van Wagenberg et al., 2012).

Important exporters of eggs and egg products to the EU are the USA, India, Argentina and Ukraine (see Appendix 2). These countries have no food safety regulations that are similar to those in the EU, such as the ban on meat and bone meal and lack of rules on the use of GMO crops as ingredients in poultry feed. In the following sections we summarise the main characteristics of the egg sector, the export position, the legislation on animal welfare and the production standards for these egg-producing countries.

USA

The USA is, with 323 million layers in 2021, the second largest egg producer in the world and also a large exporter of eggs and egg products. Egg production in the USA is mainly concentrated in the Mid-West. In the commercial egg sector numerous independent producers are marketing on a local basis, applying price competition as a major component of their marketing strategy. All producers in the top 20 have more than 5 million layers. These top 20 producers represent more than 80% of the sector. These companies have the 'economies of scale' and have a high efficiency in production, marketing and distribution.

The issue of animal welfare has become a more significant consumer concern in the USA in recent years. Proposed federal legislation (2011 proposal) that would have set national standards for egg production in the USA were not accepted by the government, however, some states, especially on the West and East coast, have implemented a cage ban. Later, the producers' organisation United Egg Producers (UEP) has established voluntary guidelines to improve the welfare of laying hens. The guidelines include provisions for more space for layers in cages, conditions for moulting and standards for beak trimming. Within the UEP programme the birds have more space in the cage. The space allowance per bird is 432 cm^2 for white layers. White layers constitute 93% of the total layer population. Participating producers will be audited annually through an independent certification programme. An example of a difference in legislation: In the USA the size of the outdoor area in free range and especially organic production is far below EU-standards.

Starting in 2015 many restaurant chains, food manufacturers, and retailers announced they would purchase 100% cage-free eggs by 2025/2026. A total of 224 million cage-free layers will be needed by 2026 to supply the customers companies that have pledged to go cage-free. At this point the market for alternative (non-cage) eggs in the USA is around 30% (IEC, 2022). However, recently some supermarket chains, e.g. Walmart, have postponed the promise on going cage free This change in market demand is expected to increase the share of layers kept in non-cage systems to around 60 to 70% in 2026.

Ukraine
After Ukraine became independent in 1991 the principles of the free market economy were introduced. Since the egg sector was privatised in 1998, it has shown remarkable progress. Although all major laying breeds can be found in the country, bird performance often lags behind their capabilities. However, in recent years performance has improved as a result of better management, improved feed quality and a modern health service. Two large companies with each millions of layers dominate the egg market in Ukraine: Ovostar and Avangard. Ukrainian exports grew rapidly in recent years and Ukraine is now the largest supplier of eggs and egg products to the EU.

In Ukraine there is no governmental legislation requiring a minimum space allowance for laying hens. It is estimated that on the farms the hens have between 400 and 450 cm^2 per bird. The Ministry of Agriculture has the objective to adapt national legislation on animal welfare to the standards of the EU. However, so far the government did set not any standards on the welfare of laying hens.

Argentina
The egg sector in Argentina is growing steadily in terms of production, value and exports. In 2021 Argentina had 48 million layers. These layers are kept on 950 farms with 92% of the hens in traditional cages (IEC, 2022). Beside the production of shell eggs Argentina also has a growing egg processing sector. The egg sector has contributed to reversing the country's situation from being an importer of egg products to becoming an important exporter.

No legislation regulating specific animal welfare practices for laying hens exists in Argentina. In 2009 a survey was conducted and interviews with producers and businessmen in the egg sector were held. The survey was carried out by the University of Buenos Aires and included 30 operations (UBA, 2009). Factors directly related to layer welfare include space allowances and methods of beak trimming. All farms in the survey kept layers in cages. The type of cage differed between farms. The average space allowance was 372 cm^2 per hen. However, there was a wide range in space allowance between companies. All surveyed farms used pullets that had their beaks trimmed. The average age at which this was performed was 12 days with a range of 6 to 28 days. The beak trimming also differed in how much of the beak was trimmed, with the majority of farms trimming between one quarter and one third of the beak. A report from Wageningen University & Research (van Horne et al., 2010) gives an extensive overview of the animal welfare situation in the layer, broiler and pig sector in Argentina.

India
India is the number four producer of eggs in the world. In 2021 India had 260 million laying hens (IEC, 2022). India is a large egg producer and exports shell eggs and dried egg products. A number of egg powder plants have been developed for export. There are 20,000 farms in the country. The farm size varies from 5,000 birds per farm to a maximum of 500,000 birds. Most of the farms keep laying hens until 76 weeks of

age and forced moulting is not practiced in India. Although western breeds are used in India, the local breed BV-300 has a high market share. This breed is completely acclimatised to the Indian climate and feed conditions, resulting in a relatively high egg production. The growing population in India will increase the local market for eggs, making export efforts unnecessary for Indian producers. However, some of the larger companies are exporting egg powder to the EU and Japan.

Most commercial layers kept on modern farms have open-sided houses where birds are housed in 3 to 4 rows and three-tier conventional cages. The standard cage size for 3 birds is 37.5 cm by 30 cm. The space allowance is 375 cm^2 per bird. This is much lower than the current EU standard of 750 cm^2 per bird. For a long time animal welfare was not an issue for the government in India because in real life improving animal welfare is limited by the poverty of a great part of the population and the life philosophy within the Hindu culture (Bracke, 2009). At the moment the India government is discussing a minimum space allowance of 550 cm^2 per hen in cage housing. This will be federal legislation and could come into force in 2023.

2 Structure and employment

2.1 Introduction

This chapter describes the economic importance of the EU egg sector. Section 2.2 describes the total egg production and Section 2.3 gives information on the structure of the sector with the number of farms. Section 2.4 deals with employment numbers while Section 2.5 gives the total economic value of the EU egg sector. Finally, Section 2.6 describes the importance of alternative housing systems in the EU countries.

2.2 Egg production

In 2021, the total production of eggs for consumption in the EU-27 was 6,502 ktonnes. Six leading countries each produce more than 500,000 tonnes of eggs: France, Germany, Spain, Italy, the Netherlands and Poland. Combined, these six countries are responsible for 72% of the EU's egg production. Table 2.1 gives an overview of the egg production for all EU member states.

Table 2.1 *EU production of eggs for consumption (1,000 tonnes) in 2021*

	production	% of total
France	930	14.3%
Germany	907	13.9%
Spain	870	13.4%
Italy	765	11.8%
Netherlands	625	9.6%
Poland	559	8.6%
Romania	350	5.4%
Czech Republic	150	2.3%
Sweden	149	2.3%
Belgium	146	2.2%
Austria	128	2.0%
Hungary	119	1.8%
Portugal	119	1.8%
Greece	100	1.5%
Bulgaria	88	1.4%
Denmark	85	1.3%
Ireland	82	1.3%
Finland	77	1.2%
Slovakia	64	1.0%
Lithuania	50	0.8%
Croatia	43	0.7%
Latvia	41	0.6%
Slovenia	29	0.4%
Cyprus	10	0.2%
Estonia	9	0.1%
Malta	7	0.1%
EU total	6,502	100%

Source: European Commission (February 2022).

2.3 Structure

A large number of farms produce eggs. Table 2.2 shows the total number of farms with laying hens for all EU countries. Table 2.2 gives the number of farms for three categories: 1 to 250 hens, 250 to 1,500 hens and more than 1,500 hens. According to Eurostat, the total number of farms with laying hens in the EU was more than 3.6 million during the most recent farm structure survey in 2016. However, only 222,690 farms (6%) can be described as 'commercial', because they have more than 1,500 laying hens. The countries with the highest number of 'commercial' farms are Poland, Austria, Germany and Greece. The data also illustrate that the total number of farms with laying hens is extremely high (more than 100,000) in Romania, Poland, Greece, Hungary and Portugal. These countries have a high number of very small farms with less than 250 layers, which are mainly non-commercial 'backyard flocks'.

Table 2.2 *Number of farms with laying hens per country in the EU (excl. UK) in 2016*

	1 - 250	250 – 1,500	1,500 and more	Total
France	4,240	6,520	13,960	24,720
Germany	810	16,990	25,930	43,730
Spain	22,490	27,030	14,370	63,890
Italy	110	4,000	6,680	10,790
Netherlands	0	50	1,300	1,350
Poland	190,460	235,510	62,950	488,920
Romania	1,819,950	389,410	14,580	2,223,940
Czech Republic	1,160	4,250	1,700	7,110
Sweden	350	1,630	980	2,960
Belgium	20	220	1,020	1,260
Austria	6,180	21,070	23,010	50,260
Hungary	108,910	24,640	4,950	138,500
Portugal	69,500	42,290	9,090	120,880
Greece	63,330	76,470	19,310	159,110
Bulgaria	52,760	11,980	1,760	66,500
Denmark	60	1,210	1,220	2,490
Ireland	1,490	3,720	2,980	8,190
Finland	0	40	300	340
Slovakia	3,730	3,190	210	7,130
Lithuania	22,910	20,540	2,680	46,130
Croatia	25,700	32,580	5,650	63,930
Latvia	15,790	9,000	2,150	26,940
Slovenia	10,310	21,800	4,590	36,700
Cyprus	3,830	3,160	1,000	7,990
Estonia	920	910	270	2,100
Malta	410	170	50	630
EU total (excl. UK)	2,425,420	958,380	222,690	3,606,490

Source: Eurostat, data 2016; size classes estimated based on SO-classification.

In the supply chain, different companies are involved in supplies and packing/processing of eggs. Examples are farms with parent stock supplying hatching eggs to hatcheries, hatcheries supplying day-old chicks and feed mills supplying feed to the farmers. The EU does not collect information on the number of companies in the supply chain. There is only very fragmented information of some member states. This information is too limited to give an estimate of the number of farms with parent stock, number of hatcheries, slaughterhouses for layers, packing stations, egg-processing companies or feed mills.

2.4 Employment

No sources are available on the total employment in the egg supply chain in the EU. Research carried out by the International Egg Commission (IEC) gives some information (IEC, 2018). The IEC collects information on the direct and indirect employment by asking their country rapporteurs. Some rapporteurs from EU countries gave the numbers for their country. Based on this information, we estimated the employment in the egg sector for the EU-27.

Direct employment relates to employment on the poultry farms, including the work for packing and processing. Indirect employment relates to all suppliers. These companies produce a wide range of items such as poultry feed (feed mills), day-old chicks (hatcheries), poultry houses (constructors), equipment, packing material, services (e.g. veterinarians) and transportation. The direct employment is 12 full-time workers per 1,000 tonnes of eggs. The indirect employment is an additional 30% of the direct employment. Based on the total egg production of 6,502 ktonnes in 2021, the direct employment is 78,000 persons. The indirect employment is 101,400 persons. The total employment in the EU egg sector is estimated to be 179,400 full-time workers in 2021.

2.5 Production value

The production value of the EU egg sector can be calculated by multiplying the total production by the average EU price. This can be done with farm prices or retail prices.

The International Egg Commission (IEC) collects the average prices in selected countries (IEC, 2022). In 2021 the average price at farm level of the EU countries was 1.18 euro per kg. In 2021 the average price at retail level of the EU countries was 3.17 euro per kg. Based on the total production in the EU in 2021 of 6,502 ktonnes, the total production at farm level prices is 7,660 million euros. The total production value of the EU egg sector at retail prices is 20,600 million euros.

The EU is an important player in the international trade of eggs and egg products. In 2021, the EU-27 exported 284,000 tonnes of egg equivalent with a value of 297 million euros. At the same time, the EU-27 is an importer of eggs and egg products. In 2021 the EU-27 imported 17,000 tonnes of egg equivalent with a value of 21 million euros. Table 2.3 gives the development of the import and export in volume and value from 2019 to 2021. In 2021 the main suppliers of eggs and egg products to the EU were from USA, Ukraine and Argentina. Exports from the EU mainly go to Japan and Switzerland. Appendix 2 gives more detailed information on the EU import of egg and egg products.

Table 2.3 *Import and export of eggs of the EU in volume (1,000 tonnes egg equivalent) and value (million euro)*

	2019	2020	2021
export volume	255	250	284
import volume	22	26	17
export value	242	246	297
import value	30	28	21

Source: European Commission (February 2022).

2.6 Housing systems

In the EU laying hens are kept in a wide variety of different housing systems. Since 2012 laying hens can only be kept in enriched cages or alternative (non-cage) systems. Eggs produced in the EU have to be labelled according to the housing system in which the laying hens are kept (EC 589/2008). The codes printed on the eggs are as follows: 3 is enriched cage, 2 is barn, 1 is free range and 0 is organic. Table 2.4 gives the

basic requirements for the various production systems defined by the EU. In the EU the minimum standard for the cage system is enriched cages. Non-cage systems are barn, free range and organic, in which hens are kept on a litter floor on one level or multi-level (aviary).

Table 2.4 *Legal requirements for the various production systems in the EU*

Production system	code	Stocking density indoor	Access to outdoor run
Enriched cage	3	750 cm^2 per hen	No
Barn	2	9 birds per m^2	No
Free range	1	9 birds per m^2	Yes, 4 m^2 per hen
Organic	0	6 birds per m^2	Yes, 4 m^2 per hen

Table 2.5 gives an overview for the situation in 2021 in the EU member states. Countries in East and Southern Europe predominantly have enriched cages systems for laying hens. More than 70% of the hens are kept in enriched cages in Poland, Spain, Portugal, Hungary, Bulgaria, Greece, Slovakia, Lithuania, Estonia and Malta. Countries with less than 20% laying hens in enriched cages are Germany, the Netherlands, Sweden, Denmark, Slovenia and Luxembourg. The data also show the differences in barn and free range systems: France, Austria and Ireland mainly have free range as the alternative system and barely have any barn systems. In many countries, the trend for the coming years will be a further move towards alternative systems. This trend will be led by the large retailers as many supermarkets have already announced a move towards cage-free systems by 2025/2026.

Table 2.5 *Laying hens (million) and share (%) of housing systems in EU member states (2021)*

	Laying hens	Enriched cage	Barn	Free range	Organic
Germany	58.1	6%	59%	22%	14%
Poland	51.2	76%	18%	5%	1%
France *	48.3	54%	12%	23%	11%
Spain	47.1	73%	16%	9%	2%
Italy	40.5	36%	55%	5%	5%
Netherlands	31.5	15%	61%	18%	6%
Belgium	10.8	36%	43%	13%	7%
Portugal	10.2	75%	19%	5%	1%
Romania	9.0	57%	37%	3%	3%
Sweden	8.7	4%	77%	5%	14%
Hungary	7.5	71%	28%	1%	0%
Czech Republic	7.5	68%	31%	1%	0%
Austria	7.4	0%	59%	28%	13%
Bulgaria	5.1	70%	28%	2%	0%
Finland	5.1	45%	44%	3%	7%
Greece **	4.6	77%	12%	5%	6%
Denmark	4.3	10%	49%	8%	33%
Ireland	3.9	48%	1%	46%	4%
Latvia	3.5	69%	27%	3%	0%
Slovakia	3.1	75%	22%	2%	0%
Lithuania	2.9	80%	19%	1%	1%
Croatia	2.4	62%	33%	4%	1%
Slovenia	1.4	17%	61%	19%	3%
Estonia	0.8	88%	8%	3%	1%
Cyprus	0.5	68%	16%	13%	3%
Malta	0.4	99%	1%	0%	0%
Luxembourg	0.1	0%	67%	11%	23%
EU total	376.0	46%	36%	12%	6%

Source: European Commission, Eggs Dashboard, 2022; * 2019 data, ** 2020 data.

3 Production costs of eggs in selected EU countries

3.1 Production costs of enriched cage eggs

The production costs of shell eggs produced by hens housed in enriched cages has been researched for the following countries: the Netherlands (NL), Germany (DE), France (FR), Spain (ES), Italy (IT), Denmark (DK), Poland (PL) and Hungary (HU). These countries are important egg-producing countries within the EU. All costs in this report are given in euros, and relate to the year 2021.

3.1.1 Production costs at primary farm

Figure 3.1 provides an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (cost of young hen at 20 weeks minus the revenue from the spent hen), feed (feed costs during the laying period), other (all other variable costs e.g. electricity and animal health), labour (cost of the labour of the farmer or a farm worker), housing (depreciation, interest and maintenance cost on building and equipment) and general (book-keeping, clothing, insurance and, if relevant, manure disposal costs).

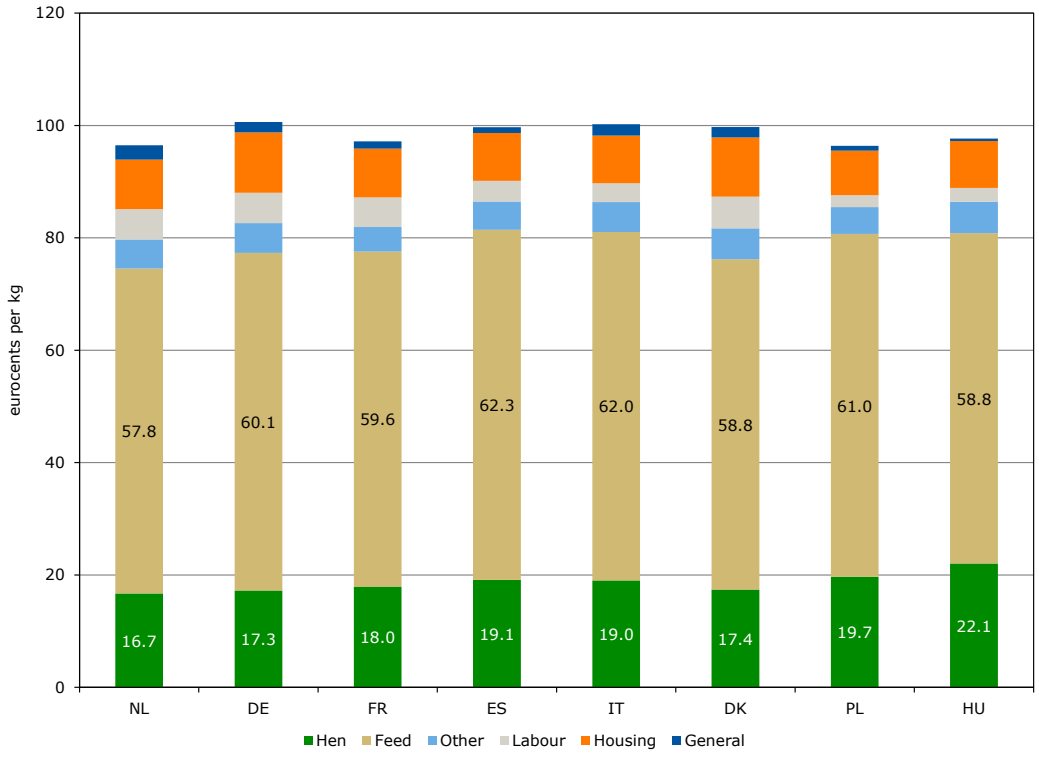

Figure 3.1 *Cost of primary production in* enriched cages *in some EU countries (eurocents per kilogram of eggs) in 2021*

The costs of primary production (in eurocents per kilogram of eggs) are higher than average in Italy, Spain, Germany and Denmark. The average of all countries is 98.5 eurocents per kg of eggs. The Netherlands and Poland have the lowest costs of production of the selected EU countries.
Table 3.1 shows the data used in the calculations. Table 3.2 gives the detailed results.

Table 3.1 *Data on egg production in selected EU countries in 2021 (enriched cages)*

	NL	DE	FR	ES	IT	DK	PL	HU
Feed price (euro/100 kg)	29.5	30.5	29.5	31.0	31.0	30.0	30.5	28.0
Price/hen at 20 weeks (euro)	4.76	4.83	4.74	4.97	4.87	4.54	4.93	5.07
Laying period (days)	490	480	440	450	440	460	440	400
Eggs per hen	438	431	395	395	385	420	390	345
Egg weight (g)	61.0	61.0	62.0	62.5	63.0	62.0	62.0	62.0
Feed conversion	1.96	1.97	2.02	2.01	2.00	1.96	2.00	2.10

Table 3.2 *Costs of primary production (in eurocents per kilogram of enriched cage eggs) in selected EU countries in 2021*

	NL	DE	FR	ES	IT	DK	PL	HU
Total costs inclusive labour	96.5	100.6	97.2	99.7	100.2	99.7	96.4	97.7
Total costs exclusive labour	91.1	95.2	91.9	96.0	96.9	94.1	94.3	95.2
Hen cost at 20 weeks	17.8	18.4	19.3	20.1	20.1	17.4	20.4	23.7
Feed	57.8	60.1	59.6	62.3	62.0	58.8	61.0	58.8
Other	5.2	5.3	4.4	5.0	5.3	5.5	4.8	5.6
Labour	5.4	5.4	5.3	3.7	3.3	5.6	2.1	2.4
Housing	8.8	10.7	8.7	8.5	8.5	10.5	7.9	8.4
General	1.6	1.6	1.3	1.3	1.3	1.5	1.1	1.2
Manure disposal	1.0	0.3	0.0	-0.3	0.7	0.4	-0.3	-0.7
Revenue spent hen	-1.1	-1.1	-1.4	-1.0	-1.0	0.0	-0.7	-1.7

The differences in costs for the primary production are mainly caused by differences in feed costs, the price of young hens (pullets), housing costs and manure disposal costs. Within the selected EU countries Italy and Spain have the highest feed price, and Hungary the lowest. Young hens (pullets) are relatively cheap in the Netherlands, France and Denmark (see Table 3.1). Poland and Hungary have the advantage of low labour costs and positive revenues for manure (see Table 3.2). Farmers in the Netherlands, Germany and Denmark have higher housing costs as a result of a more expensive poultry house and equipment. All countries have a revenue for spent hens, except for Denmark. The average production cost in the EU, based on these eight countries, is 98.5 eurocents per kg of eggs.

3.1.2 Production costs of egg powder

The cost of producing egg powder are made up of the cost of eggs and the cost of processing, in a large commercial egg powder plant. The basic assumption is that the dry matter content of the eggs is 20.5%. The main components in the processing are building and equipment (38%), labour (27%) and energy (22%). The other costs (13%) are for packaging and sales, and vary from country to country. However, because all processing plants in the EU use advanced modern equipment, it is assumed that the differences in processing between countries are mainly a result of differences in labour costs. Also differences in interest rates between countries are taken into account and have an impact on the annual costs of building and equipment. Table 3.3 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 3.2 gives the same data in a graph.
The results show that the processing costs amount to approximately 19% of the total cost to produce egg powder. As a result of lower labour costs the production costs of egg powder are lower in Poland and Hungary.

Table 3.3 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder made of enriched cage eggs in 2021*

	NL	DE	FR	ES	IT	DK	PL	HU
Farm level costs	471	491	474	486	489	487	470	477
Processing costs	124	125	121	111	111	124	101	98
Total	595	615	595	597	599	611	571	574

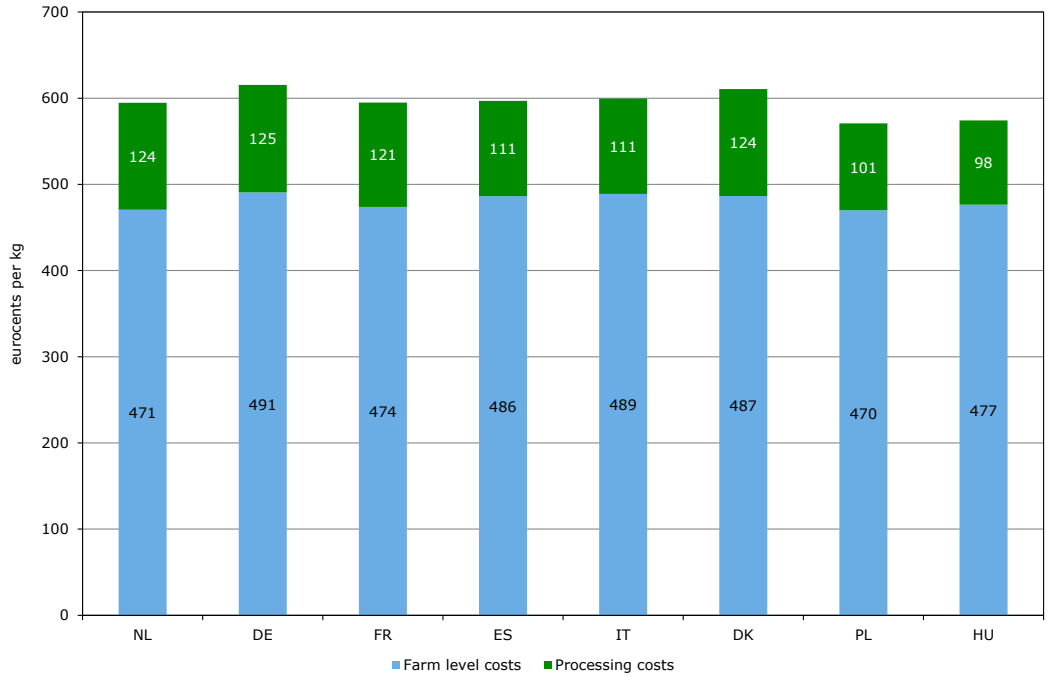

Figure 3.2 *Cost of production of whole egg powder from* enriched cages *in some EU countries (eurocents per kilogram of egg powder) in 2021*

3.2 Production costs of barn eggs

The production costs of shell eggs produced by hens housed in the barn system has been researched for the same EU countries: the Netherlands (NL), Germany (DE), France (FR), Spain (ES), Italy (IT), Denmark (DK), Poland (PL) and Hungary (HU). Calculations are based on keeping hens in an aviary system with a density of maximum 9 hens per square meter of usable area (equal to around 18 hens per square meter poultry house). From all countries the following production results were analysed: laying period, number of eggs, feed conversion and mortality. Also investment in building and equipment and labour input was estimated.

3.2.1 Production costs at primary farm

Figure 3.3 provides an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (cost of young hen at 20 weeks, less the revenue from the spent hen), feed (feed costs during the laying period), other (all other variable costs e.g. electricity and animal health), labour (cost of the labour of the farmer or a farm worker), housing (depreciation, interest and maintenance cost on building and equipment) and general costs (book-keeping, clothing, insurance and, if applicable, manure disposal costs).

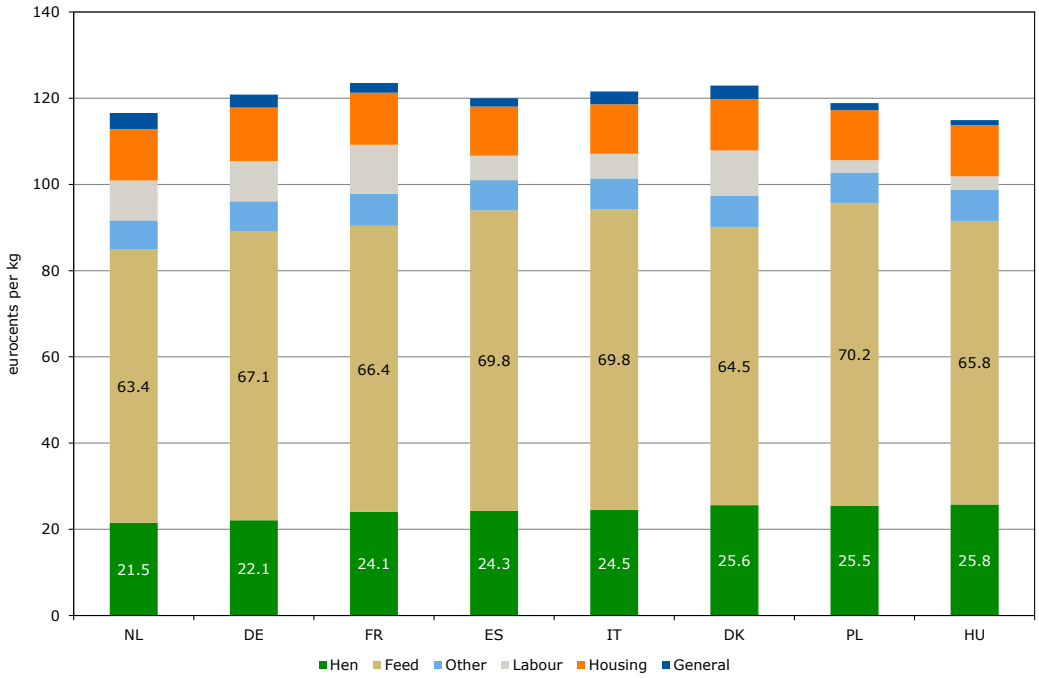

Figure 3.3 *Cost of primary production in* barns *in some EU countries (eurocents per kilogram of eggs) in 2021*

The costs of primary production (in eurocents per kilogram of eggs) are the highest in Denmark and France. The EU average is these countries is 120 eurocents per kg of eggs. In the Netherlands and Hungary the costs of production of barn eggs are slightly lower compared to the other EU countries. Table 3.4 gives the detailed results.

Table 3.4 *Costs of primary production (in eurocents per kilogram) of barn eggs in some EU countries in 2021*

	NL	DE	FR	ES	IT	DK	PL	HU
Total costs inclusive labour	116.6	120.9	123.5	120.0	121.6	122.9	118.9	114.9
Total costs exclusive labour	107.4	111.5	112.1	114.3	115.9	112.4	116.0	111.8
Hen cost at 20 weeks	22.8	23.4	25.5	25.3	25.6	25.6	26.2	27.2
Feed	63.4	67.1	66.4	69.8	69.8	64.5	70.2	65.8
Other	6.8	6.9	7.4	7.0	7.2	7.2	7.1	7.2
Labour	9.2	9.4	11.4	5.7	5.7	10.6	2.9	3.1
Housing	12.0	12.4	12.1	11.4	11.5	12.0	11.6	11.8
General	2.7	2.7	2.2	2.2	2.2	2.7	2.0	2.0
Manure disposal	1.0	0.3	0.0	-0.3	0.8	0.4	-0.3	-0.8
Revenue spent hen	-1.3	-1.3	-1.4	-1.0	-1.1	0.0	-0.7	-1.5

The differences in costs for the primary production are mainly caused by differences in feed costs, the price of young hens (pullets), housing costs and manure disposal costs. The Netherlands has relatively low production costs, as a result of good performance with a high egg production. France and Denmark have the highest production costs for barn eggs. The average production costs in the EU, based on these eight countries, are 120 eurocents per kg of eggs. This is 22% higher compared to the average for enriched cage eggs.

3.2.2 Production costs of egg powder

The cost of producing egg powder is made up of the cost of eggs and the cost of processing, in a large commercial egg powder plant. The basic assumptions are similar to those of processing enriched cage eggs

(see Section 3.1.2). Table 3.5 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 3.4 gives the same data in a graph.

The results show that the processing costs amount to approximately 16% of the total cost to produce egg powder. The differences between the countries are relatively small. Most expensive are Denmark and France (724) and the cheapest country is Hungary (658 eurocent per kg egg powder).

Table 3.5 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder of barn eggs in 2021*

	NL	DE	FR	ES	IT	DK	PL	HU
Farm level costs	569	590	603	585	593	600	580	561
Processing costs	124	125	121	111	111	124	101	98
Total	693	714	724	696	704	724	681	658

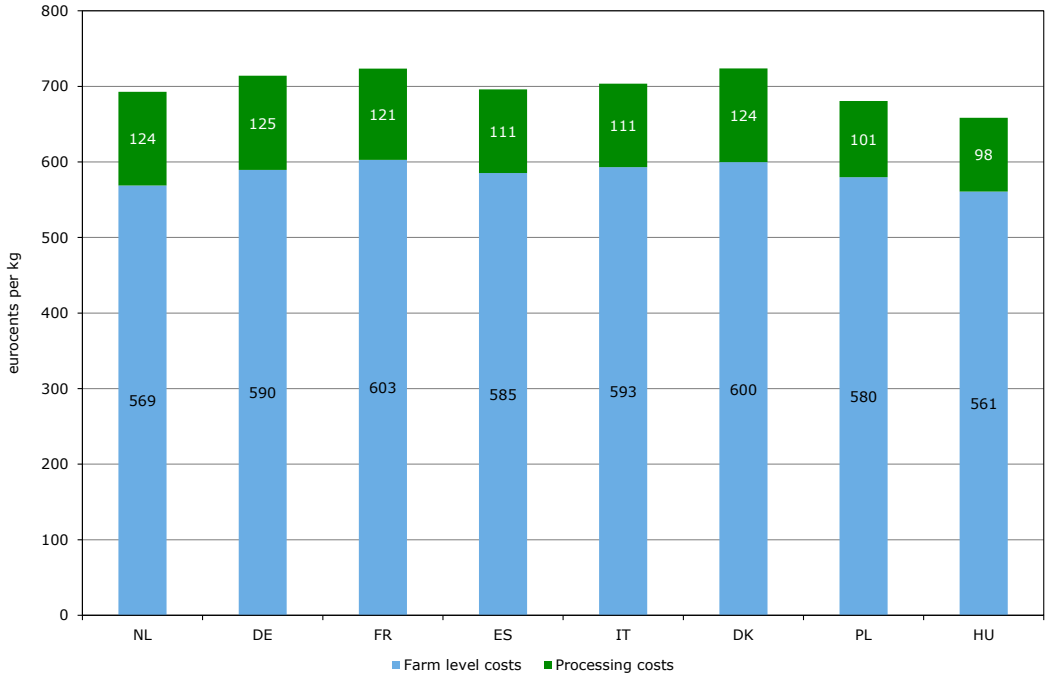

Figure 3.4 *Cost of production of whole egg powder from* barns *in some EU countries (eurocents per kilogram of egg powder) in 2021*

The average production cost of egg powder from barn eggs in the EU, in these eight countries, is 699 eurocents per kg of egg powder. This is 17% higher compared to the average for the offer price of egg powder produced from enriched cage eggs.

3.3 Production costs of free range eggs

The production costs of shell eggs produced by hens housed in free range systems was researched for the same EU countries: the Netherlands (NL), Germany (DE), France (FR), Spain (ES), Italy (IT), Denmark (DK), Poland (PL) and Hungary (HU). Calculations are based on keeping hens in an aviary system with access to an outdoor range. All countries provided the following production results: laying period, number of eggs, feed conversion and mortality. Also investment in building and equipment and labour input was estimated.

3.3.1 Production costs at primary farm

Figure 3.5 provides an insight into the build-up of primary production costs. The production costs can be divided into six components: hen (cost of young hen at 20 weeks, less the revenue from the spent hen), feed (feed costs during the laying period), other (all other variable costs e.g. electricity and animal health), labour (cost of the labour of the farmer or a farm worker), housing (depreciation, interest and maintenance cost on building and equipment) and general (book-keeping, clothing, insurance and, if relevant, manure disposal costs).

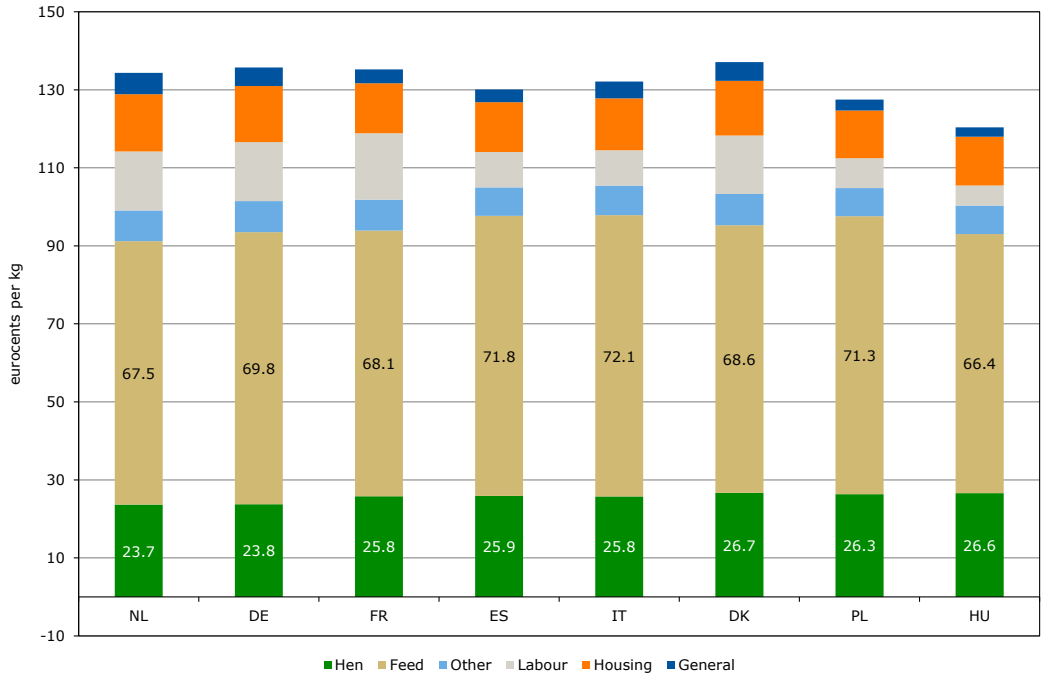

Figure 3.5 *Cost of primary production in free range systems in some EU countries (eurocents per kilogram of eggs) in 2021*

The costs of primary production (in eurocents per kilogram of eggs) are the highest in Denmark. In Hungary the costs of production of free range eggs are at the lowest level of the selected EU countries. Table 3.6 gives the details of the results.

Table 3.6 *Costs of primary production (in eurocents per kilogram) of free range eggs in some EU countries in 2021*

	NL	DE	FR	ES	IT	DK	PL	HU
Total costs inclusive labour	134.4	135.7	135.2	130.1	132.1	137.1	127.5	120.4
Total costs exclusive labour	119.2	120.6	118.2	121.0	123.0	122.1	119.9	115.2
Hen cost at 20 weeks	25.1	25.1	27.3	27.0	26.8	26.7	27.1	28.1
Feed	67.5	69.8	68.1	71.8	72.1	68.6	71.3	66.4
Other	7.9	7.9	7.9	7.3	7.5	8.0	7.2	7.3
Labour	15.1	15.1	17.0	9.1	9.1	15.0	7.6	5.2
Housing	14.7	14.4	12.8	12.8	13.3	14.0	12.2	12.5
General	4.4	4.4	3.6	3.6	3.6	4.4	3.1	3.2
Manure disposal	1.0	0.3	0.0	-0.3	0.7	0.4	-0.3	-0.8
Revenue spent hen	-1.4	-1.4	-1.5	-1.1	-1.0	0.0	-0.8	-1.5

The differences in costs for the primary production are mainly caused by differences in feed costs, the price of young hens (pullets), housing costs and manure disposal costs. The Netherlands and Germany have lower

production costs as a result of good performance with a high egg production. The average production costs in the EU, based on these eight countries, are 132 eurocents per kg of eggs. This is 34% higher compared to the average for the enriched cage eggs.

3.3.2 Production costs egg powder

The cost of producing egg powder is made up of the cost of eggs and the cost of processing. The costs are calculated based on processing in a large commercial egg powder plant. The basic assumptions are similar to those of processing enriched cage eggs (see Section 3.1.2). Table 3.7 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 3.6 gives the same data in a graph.

The results show that the processing costs amount to approximately 15% of the total cost to produce egg powder. Table 3.7 shows that Denmark has the highest costs and Hungary is the cheapest country.

Table 3.7 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder of free range eggs in 2021*

	NL	DE	FR	ES	IT	DK	PL	HU
Farm level costs	655	662	660	635	645	669	622	587
Processing costs	124	125	121	111	111	124	101	98
Total	780	787	781	745	755	793	723	685

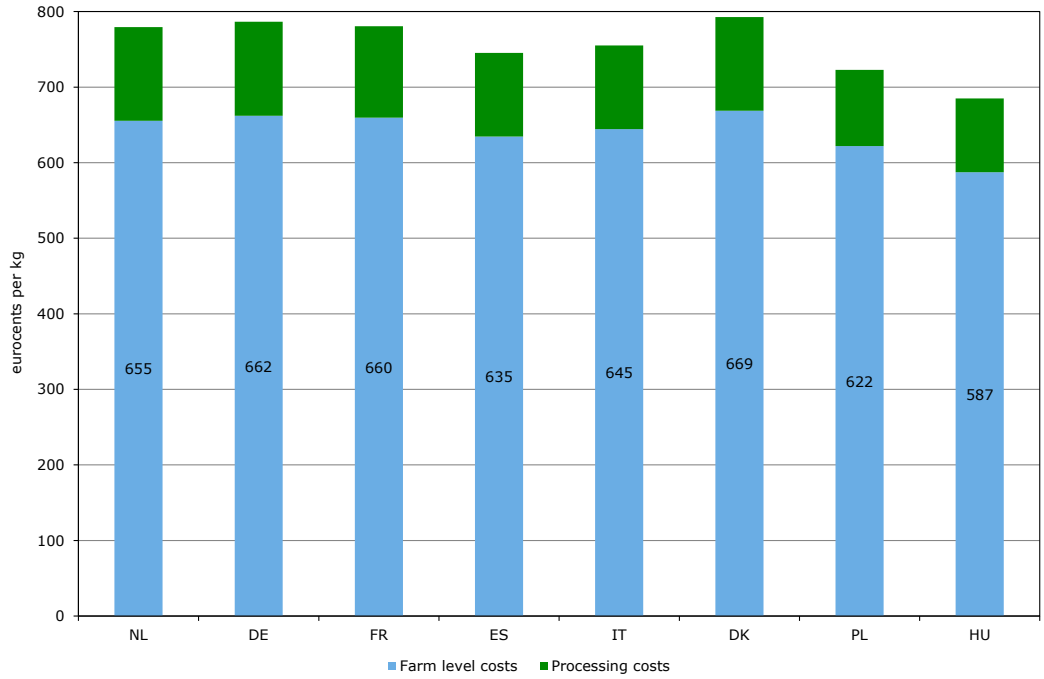

Figure 3.6 *Cost of production of whole egg powder from free range eggs in some EU countries (eurocents per kilogram of egg powder) in 2021*

The average production cost of egg powder, based on egg from free range systems in the EU, and based on these eight countries, is 756 eurocents per kg of egg powder. This is 27% higher compared to the average for egg powder produced from enriched cage eggs.

4 Production costs of eggs in selected non-EU countries

The production costs of shell eggs for consumption has been researched for the following non-EU countries: Ukraine (UKR), the United States of America (USA), Argentina (ARG) and India (IND). These four countries are the main exporters of eggs and egg products to the EU. A comparison with the UK as a third country is not necessary, as the previous study showed that the primary production costs in the UK were significantly higher compared to the other EU member states in the comparison: about +8% (Van Horne, 2019). Our expectation is that this situation has not changed substantially.
Appendix 2 gives an overview of the main exporters of eggs and egg products (in egg equivalent) to the EU. The production costs of the third countries are presented in euros.

4.1 Production costs of cage eggs at primary farm

Figure 4.1 provides an insight into the build-up of primary production costs, and includes a comparison with the average EU level. The hen costs are defined as the hen cost at 20 weeks, less the revenue of the spent hen. General costs are the actual general costs plus the manure disposal costs, or less the revenue of manure (see Table 4.1 for the details).

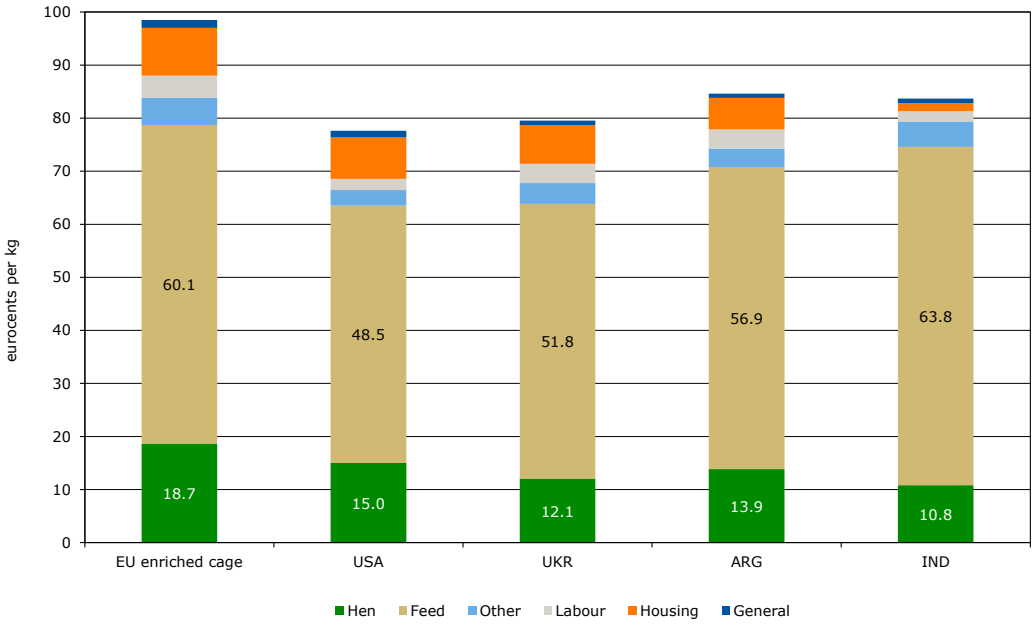

Figure 4.1 *Cost of primary production in* enriched cages *in the EU (average) and conventional cages in some non-EU countries (eurocents per kilogram of eggs) in 2021*

The costs of primary production in all four third countries are clearly lower than in the EU. In the United States and Ukraine the costs are respectively 21 and 19% lower than the EU level. The difference with Argentina and India is smaller; the production costs are 14 to 15% below the EU average of 98 eurocents per kg of eggs. Table 4.1 gives an overview of the input data used for the calculation and Table 4.2 gives the detailed results.

Table 4.1 *Data on egg production in selected non-EU countries in 2021*

	EU	USA	UKR	ARG	IND
Feed price (euro/100 kg)	30.0	24.8	25.5	27.5	28.5
Price/hen at 20 weeks (euro)	4.84	3.87	3.83	3.83	3.48
Laying period (days)	450	490	440	450	440
Eggs per hen	400	430	375	385	375
Egg weight (g)	61.9	60.0	63.0	63.0	58.0
Feed conversion	2.00	1.96	2.03	2.07	2.24

Table 4.2 *Costs of primary production (in eurocents per kilogram of eggs) in some non-EU countries in 2021*

	EU	USA	UKR	ARG	IND
Total costs inclusive labour	98.5	77.6	79.5	84.6	83.7
Total costs exclusive labour	94.3	75.5	75.9	81.0	81.8
Hen cost at 20 weeks	19.7	15.0	16.2	15.8	16.0
Feed	60.1	48.5	51.8	56.9	63.8
Other	5.1	2.9	3.9	3.5	4.8
Labour	4.2	2.1	3.6	3.6	1.9
Housing	9.0	7.8	7.3	5.9	1.5
General	1.4	1.2	0.8	0.8	0.9
Manure disposal	0.1	0.0	0.0	0.0	0.0
Revenue spent hen	-1.0	0.0	-4.2	-1.9	-5.2

The feed price determines the total production costs to a significant extent. The feed price is considerably lower in the USA and Ukraine than it is in the EU. The lower feed price in these countries can largely be explained by the domestic availability of sizeable quantities of feed ingredients such as maize and soy beans. European producers partly depend on South American and US imports for some of their feed ingredients. The costs of storage, transport and merchant's profit increases the price of feed ingredients in Europe. The price of a young hen is also lower because of the low feed price.

In addition to the aforementioned differences in the feed and young hen prices, some third countries also have the advantage of lower housing costs and labour costs. Wages are much lower in Ukraine, Argentina and India. The difference in labour costs between Europe and the USA is mainly attributable to the social security system, with higher employer charges being paid in Europe.

In all mentioned third countries, producers have lower costs because legislation on environment, food safety and animal welfare is less stringent than in the EU. See Chapter 1.

4.2 Production costs of egg powder of cage eggs

The cost of producing egg powder consists of the costs of eggs and the cost of processing. The costs are calculated based on processing in a large commercial egg powder plant. The calculations are similar to the method described in Section 3.1.2. Table 4.3 gives the final results of costs at farm level and the costs of processing in euros per kg egg powder. Figure 4.2 gives the same data in a graph.

Table 4.3 *Cost of primary production, cost of processing and total costs in eurocents per kg egg powder of cage eggs in 2021 (enriched cage in the EU)*

	EU	USA	UKR	ARG	IND
Farm level costs	480	379	388	413	408
Processing costs	114	101	105	111	97
Total	595	480	493	524	505

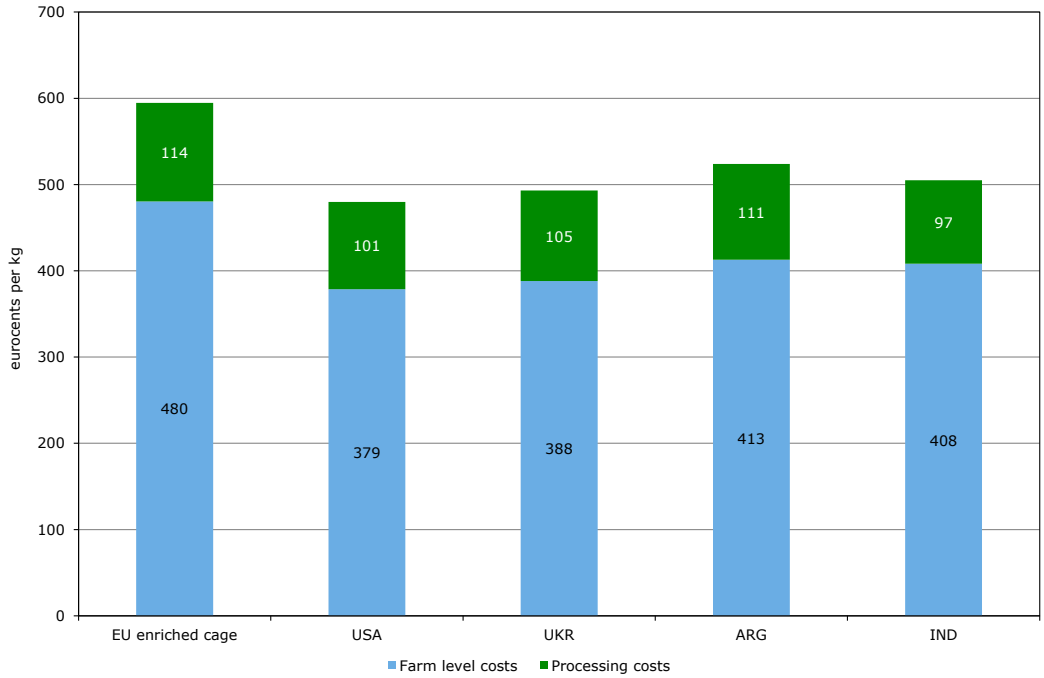

Figure 4.2 *Cost of production of whole egg powder in some non-EU countries (eurocents per kilogram of egg powder) in 2021*

Figure 4.2 shows that the USA, Ukraine, India and Argentina are respectively 19%, 17%, 15% and 12% cheaper than the average EU production costs of egg powder.

5 Results of different scenarios

In this chapter four scenarios were defined (Section 5.1), which were examined for shell eggs (Section 5.2) and for whole egg powder (Section 5.3). In all figures, the EU level is an average of the eight EU countries as shown in Chapter 3: the Netherlands, Germany, France, Spain, Italy, Denmark, Poland and Hungary.

5.1 Description of the scenarios

The EU has a set of rules on trade with third countries. Part of these rules can be import levies and tariff quotas. Within the GATT agreement of 1995 a reduction of import tariffs for a maximum quantity of eggs and egg products was agreed. Later bi-lateral agreements were made with Mexico, Ukraine, Canada and Japan. Appendix 4 gives an overview of the main import levies and tariff quotas on eggs and egg products. The basic import levy for fresh eggs is 0.30 euro per kg and 1.37 euro per kg of whole egg powder.

To show the impact of a possible change in import levies and a change in the exchange rate on the competitiveness of EU egg producers and egg processors, four scenarios for the future have been developed:

1. 50% reduction of the EU import levies on egg and egg products, as a possible result of a new multilateral (WTO) agreement or bilateral agreement.
2. 10% lower exchange rates of the US dollar, Argentine peso, Ukrainian hryvnia and Indian rupee. The average exchange rate in 2021 was used to convert the production costs of all countries to euros. In Appendix 1 the development of the exchange rate of some non-EU countries is given.
3. A combination of 50% lower import levies and a 10% lower exchange rate of the third countries' currencies.
4. A combination of no import levies and a 10% lower exchange rate of the third countries' currencies. This is the 'worst-case' scenario.

5.2 Shell eggs

5.2.1 Basic situation

In order to form an idea of the transport costs from the major production area of a country to an EU market region, in this case Germany (Frankfurt am Main), the transport costs have been added to the production costs on the basis of a full truckload of shell eggs. For that purpose, an offer price in Germany has been calculated, which is the total of production costs (farm level and processing), transportation costs and import levies. The results clearly indicate that it was not possible for the egg producers in the selected third countries to compete in the supply of shell eggs to Germany in 2021. The horizontal line indicates the EU level of total costs, including the 4 eurocents/kg cost of transport to Germany. Ukraine could be a threat for EU egg producers, but the current 30 eurocents/kg levy on imports means that it is not cost effective to export shell eggs to the EU market. Figure 5.1 also shows that imports from Indian and Argentine producers will not be competitive in a situation if there were to be no import levies, because of the high transport costs (by truck and ship). Another important reason for India and Argentine not to compete in the shell egg market is the fact that the product quality will deteriorate during long distance transport.

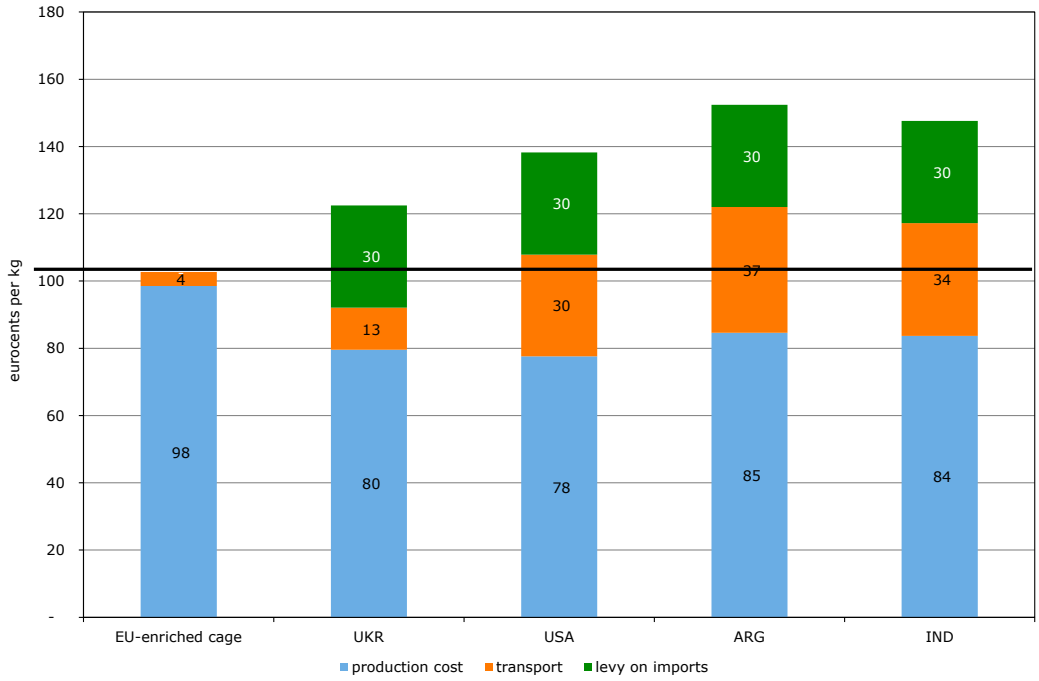

Figure 5.1 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (*enriched cages*; horizontal line) and non-EU countries in eurocents per kilogram of egg (basic situation)*

Figure 5.2 shows that if shell eggs from barn and free range systems produced in EU countries would have to compete on the world market, then the offer price of eggs from Ukrainian producers would be close to the EU offer price, even in a situation with import levies. However, this is not really the case, because barn eggs and free range eggs are sold on a specific market. Therefore, this is not included in the scenarios.

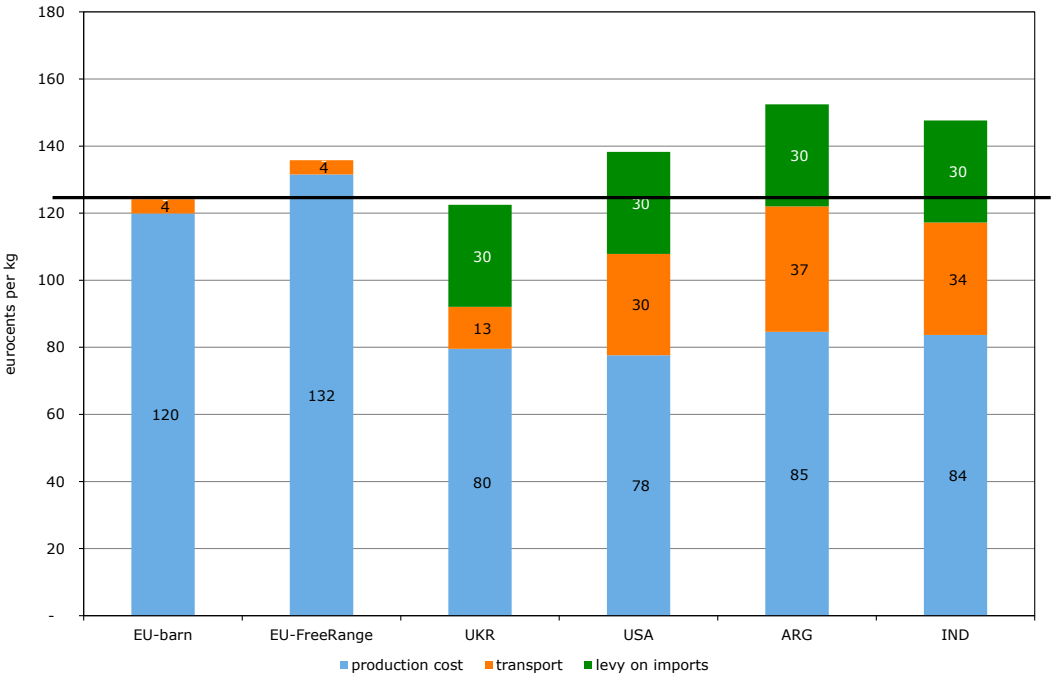

Figure 5.2 *Offer price of shell eggs in Germany from EU average (*barn eggs and free range eggs*) and non-EU countries (*cage eggs*) in eurocents per kilogram of egg (basic situation)*

5.2.2 Scenario 1 - Lower EU import levies

In the first scenario the impact of 50% lower levies on imports into the EU has been examined. As Figure 5.3 illustrates, in this scenario Ukraine would be the most competitive supplier of shell eggs to Germany in 2021. The result of the lowering of the import levies is that Ukraine can almost compete on the EU market. In this scenario other non-EU countries would not be competitive on the EU market.

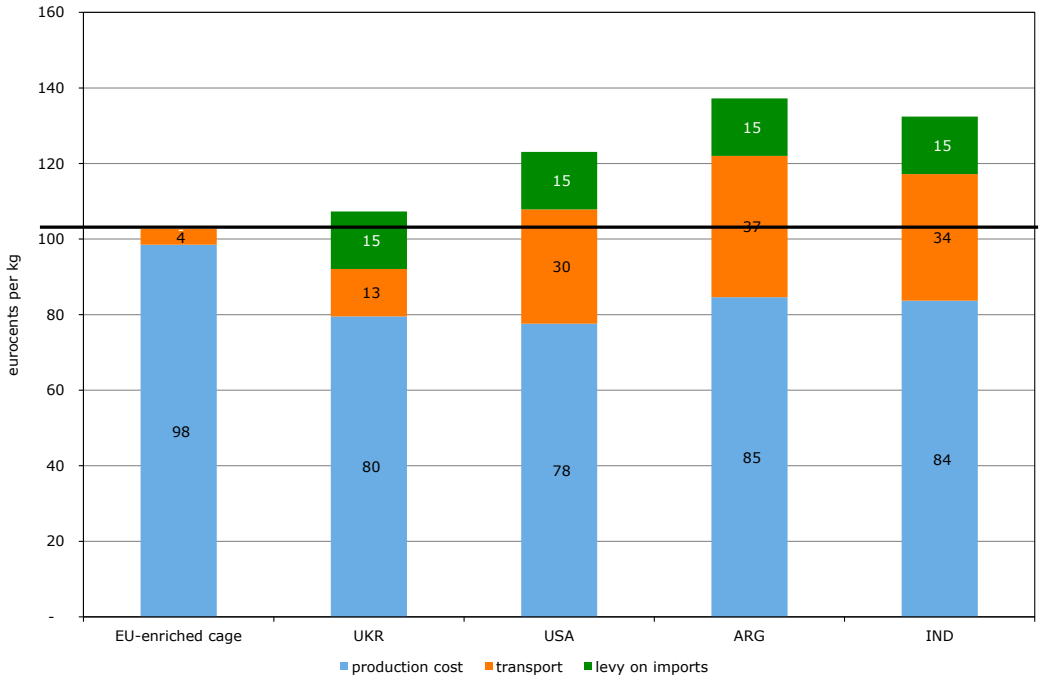

Figure 5.3 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 1: 50% lower import levies)*

5.2.3 Scenario 2 - Lower exchange rates

This second scenario evaluates the consequences of 10% lower exchange rates of the currencies of all non-EU countries. The analysed lower exchange rates have less impact than the lower import levies of scenario 1. Figure 5.4 shows that in the case of 10% lower exchange rates none of the non-EU countries would be really competitive in the EU market.

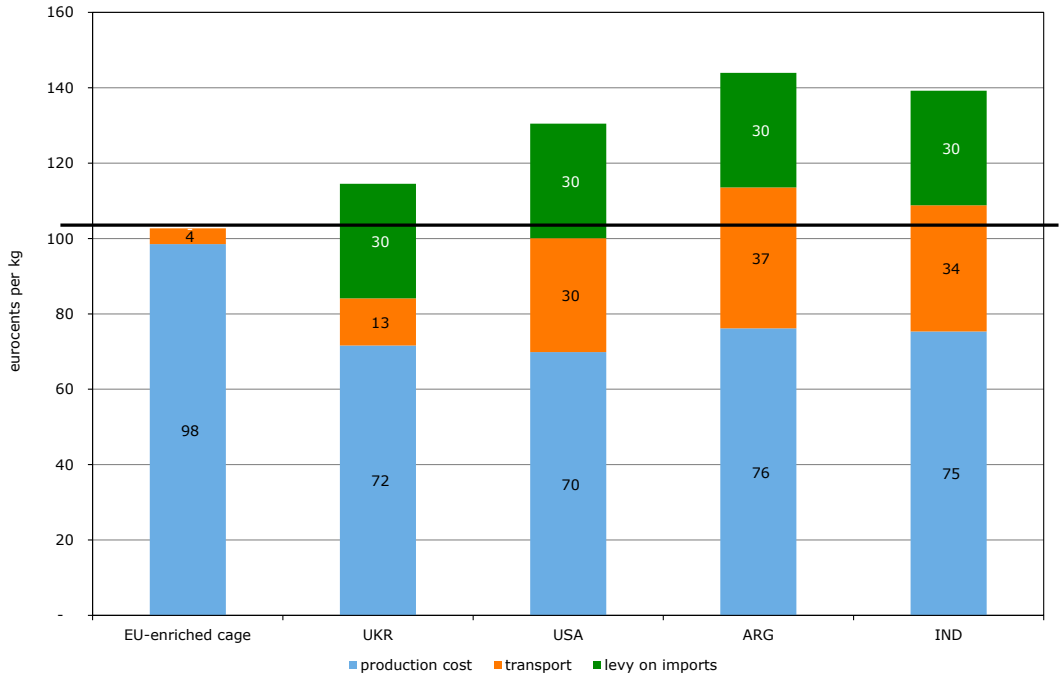

Figure 5.4 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 2: 10% lower exchange rates)*

5.2.4 Scenario 3 - Combination of lower import levies and lower exchange rates

The third scenario is a combination of the previous scenarios: 50% lower import levies and also 10% lower exchange rates of all non-EU currencies. The consequences of the combination of 50% lower levies on imports and 10% lower exchange rates are indicated in Figure 5.5. In this scenario, Ukraine obtains a very competitive position on the EU market for shell eggs. The other non-EU countries would not be competitive.

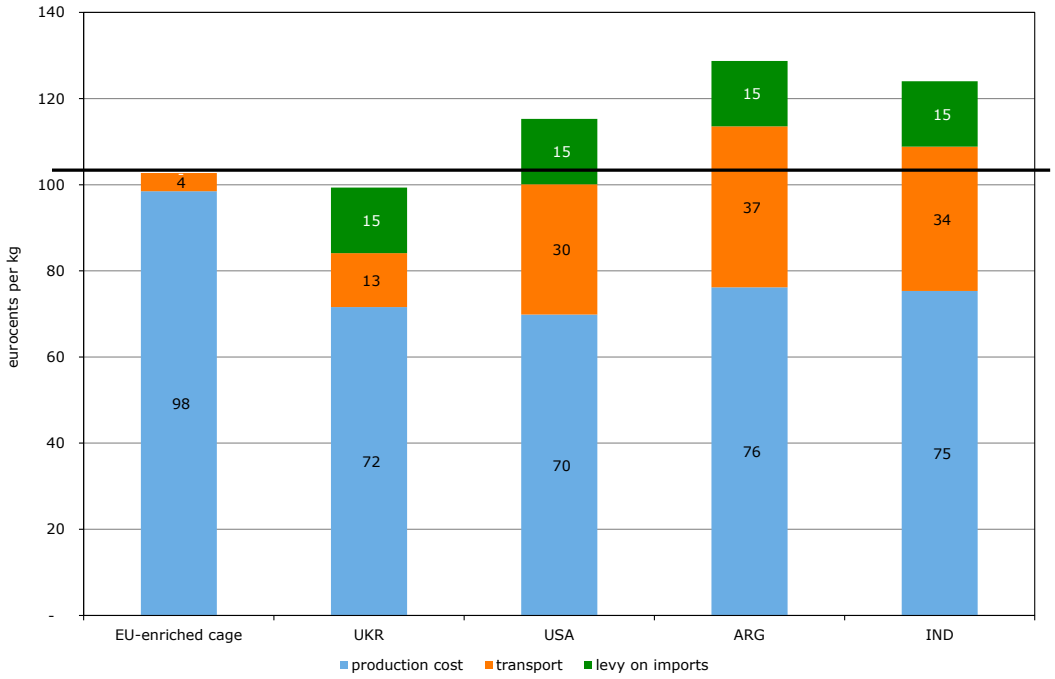

Figure 5.5 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 3: 50% lower import levies and 10% lower exchange rate)*

5.2.5 Scenario 4 - Combination of zero import levies and lower exchange rates

This scenario is a combination of zero import levies and 10% lower exchange rates of all non-EU currencies. In fact, this is a 'worst-case' scenario. The consequences of the combination of no import levies and 10% lower exchange rates are indicated in Figure 5.6. In this scenario the Ukraine is very competitive on the EU market. Also, the USA has a lower offer price than the EU producers. The difference in offer price for India compared to the EU producers is very small.

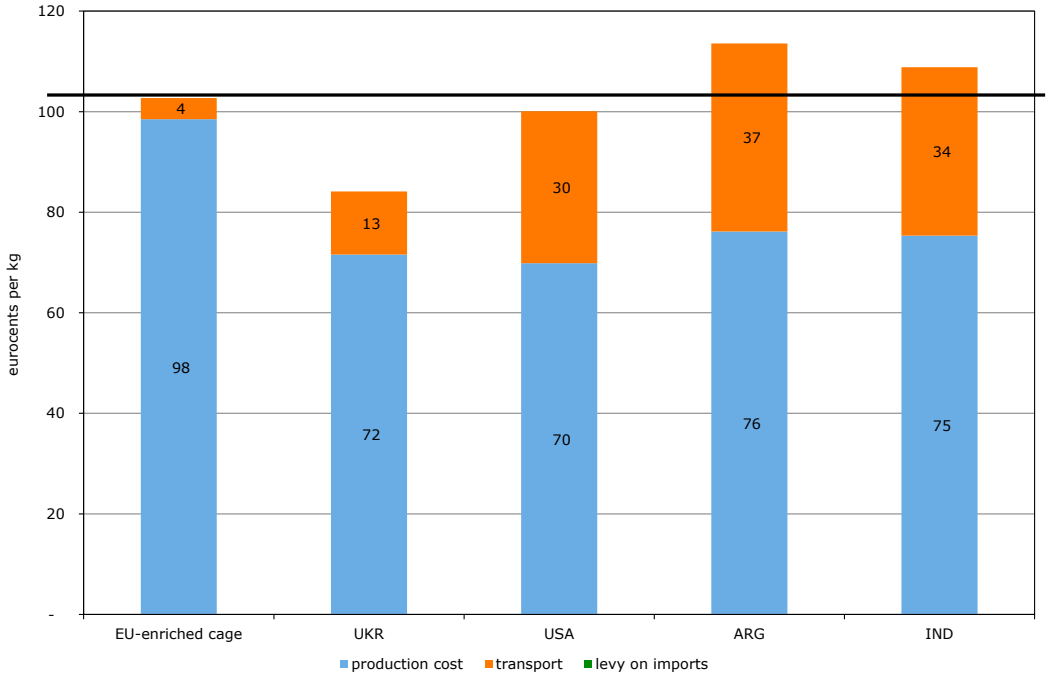

Figure 5.6 *Offer price of shell eggs (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram of egg (scenario 4: zero import levies and 10% lower exchange rates)*

5.3 Whole egg powder

Egg powder is more suitable for long-distance transport than shell eggs because there is no decrease in product quality after months of storage and long distance transport. Another advantage of egg powder is the relatively low cost of transport as the product is dried.

5.3.1 Basic situation

The assumed market location is Frankfurt am Main in Germany, for which an offer price has been calculated. The offer price is the total of production costs, processing costs, transportation costs and import levies. The results are shown in Figure 5.7. This figure shows that for whole egg powder the competition from non-EU countries is a real threat. However, the levies on imports still provide enough protection for whole egg powder entering the EU market. The full tariff for whole egg powder is 1.37 euro per kg.

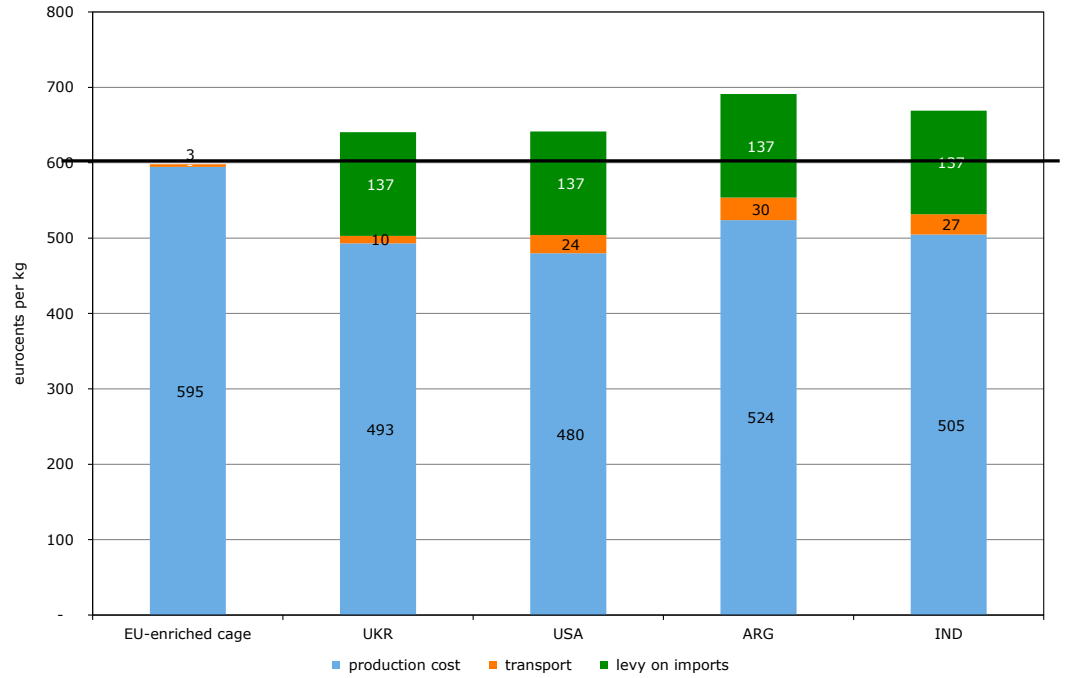

Figure 5.7 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (enriched cage; horizontal line) and non-EU countries in eurocents per kilogram (basic situation)*

Figure 5.8 shows that if egg powder in the EU would be produced from barn eggs and free range, then this product could not compete with egg powder from Ukraine and the USA, even in a situation with full import levies. However, in practice egg powder made from barn and free range eggs is sold to a specific market. Therefore, this is not included in the scenarios.

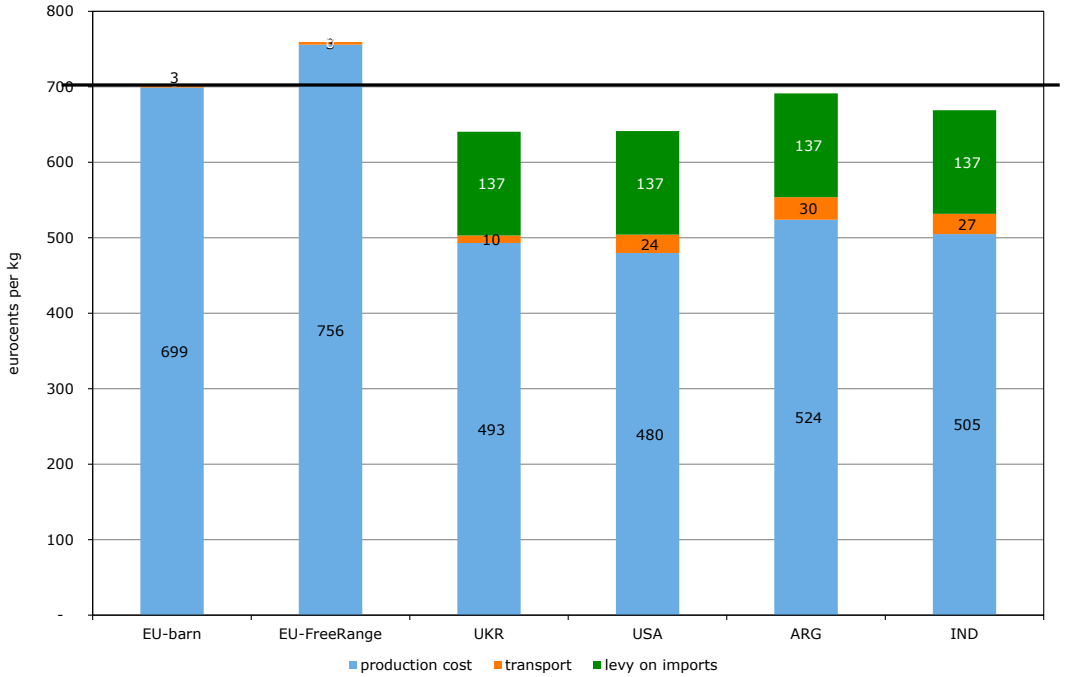

Figure 5.8 *Offer price of whole egg powder in Germany from EU average (*barn eggs and free range eggs*) and non-EU countries (*cage eggs*) in eurocents per kilogram (basic situation)*

5.3.2 Scenario 1 - Lower EU import levies

Figure 5.9 shows that 50% lower import levies will mean that several analysed non-EU countries can be relatively cheap suppliers of egg powder to the EU market. The total costs of production, transport and import levies of the Ukraine and the USA are clearly below the average EU level.

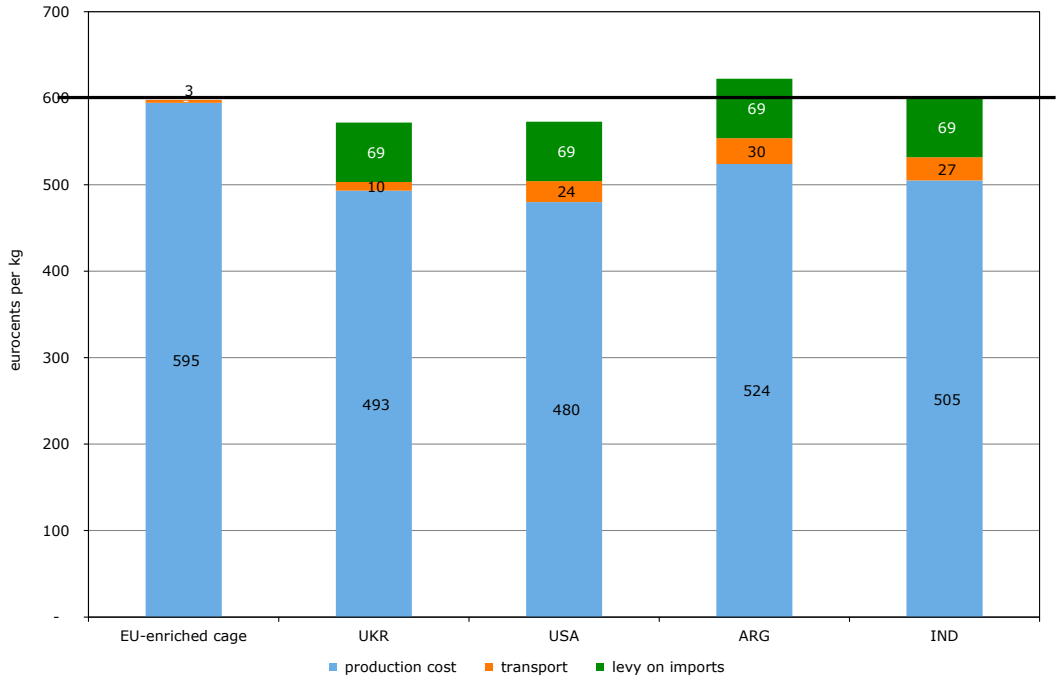

Figure 5.9 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 1: 50% lower import levies)*

5.3.3 Scenario 2 - Lower exchange rates

This second scenario evaluates the consequences of 10% lower exchange rates of all non-EU currencies. In Figure 5.10 the impact of lower exchange rates is shown. In this scenario the Ukraine and the USA can be relatively cheap suppliers of whole egg powder to the EU market. The total costs of production, transport and levies of Ukraine and USA would be below the average EU level. However, this scenario has less impact than the previous scenario with the lower import levies.

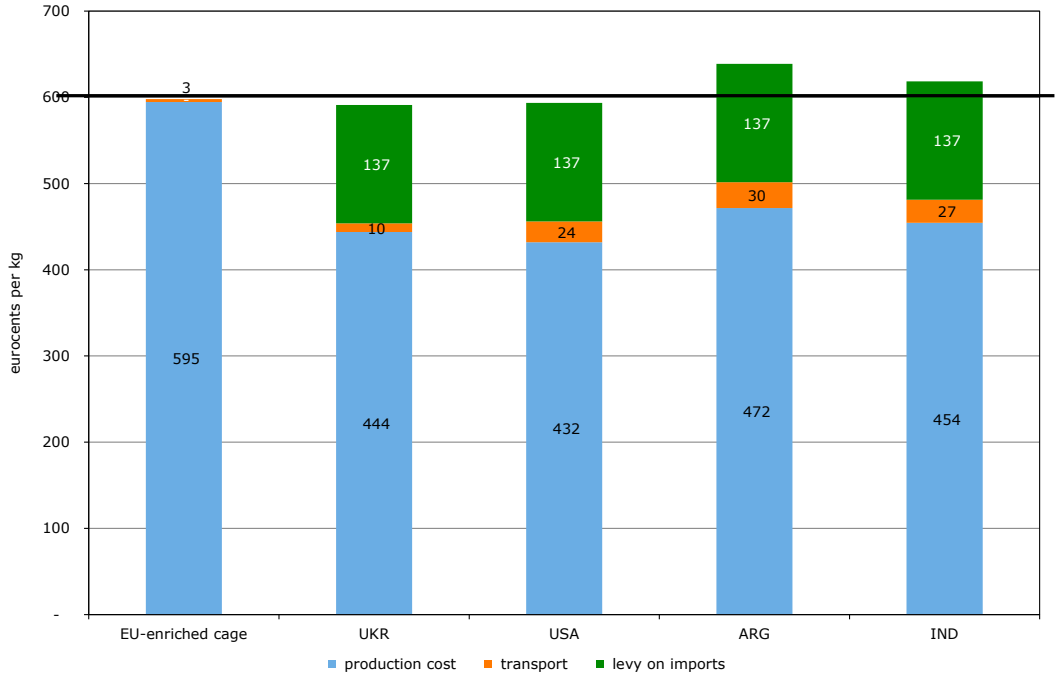

Figure 5.10 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 2: 10% lower exchange rate)*

5.3.4 Scenario 3 - Combination of lower import levies and lower exchange rates

This scenario is a combination of the previous two scenarios: 50% lower import levies (scenario 1) and also 10% lower exchange rates of all non-EU currencies (scenario 2). The consequences of this combination are illustrated in Figure 5.11. In this scenario all four non-EU countries would be very cheap suppliers of whole egg powder to the EU market.

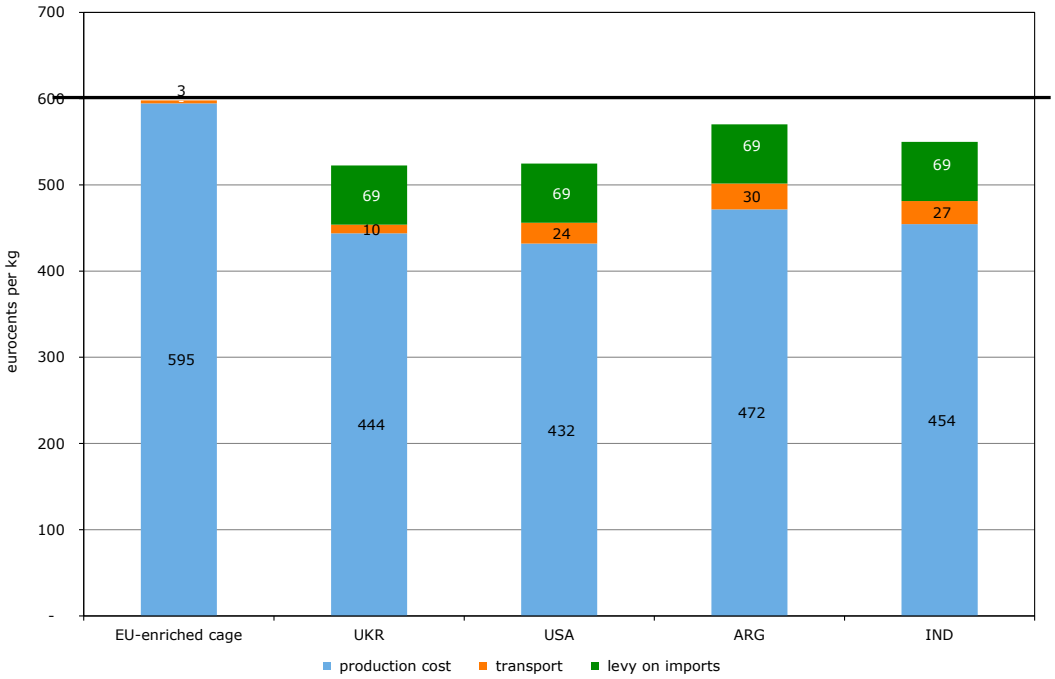

Figure 5.11 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 3: 50% lower import levies and 10% lower exchange rate)*

5.3.5 Scenario 4 - Combination of zero import levies and lower exchange rates

This scenario is a combination of zero import levies and 10% lower exchange rates of all non-EU currencies. In fact, this is a 'worst-case' scenario. The consequences of this scenario are illustrated in Figure 5.12. In this worst-case scenario all non-EU countries would be very cheap suppliers of whole egg powder to the EU market.

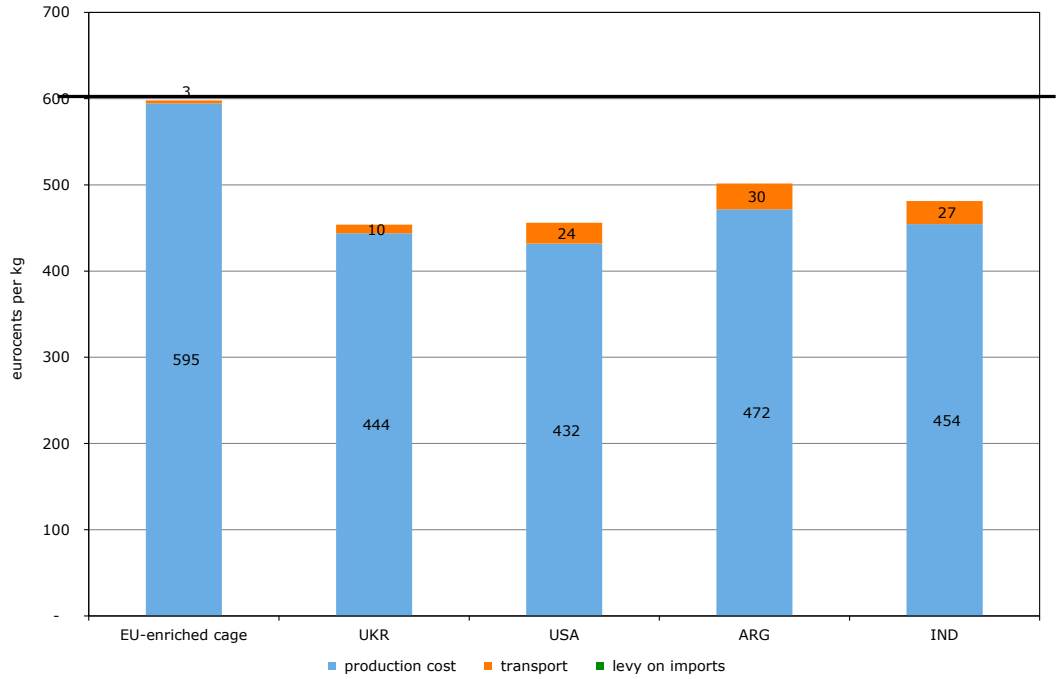

Figure 5.12 *Offer price of whole egg powder (*cage eggs*) in Germany from EU average (horizontal line) and non-EU countries in eurocents per kilogram (scenario 4: zero import levies and 10% lower exchange rate)*

6 Conclusions

Structure and employment
In 2021, the total egg production in the EU-27 was 6,502 ktonnes. The most recent number of farms with laying hens in the EU indicates 3.6 million. Of these farms, 222,690 have more than 1,500 hens and can be described as commercial. In the egg supply chain, different companies are involved in supplies (e.g. hatcheries, feed mills), packing and processing. The total employment in the EU egg supply chain is estimated to be 179,400 full-time workers.

Economic importance of the egg sector
The total production value of the egg sector in the EU-27 in 2021 was 7,660 million euros, at farm-level prices. The total production value at retail prices is 20,600 million euros. The EU is an important player in the international trade of eggs and egg products. In 2021 the EU-27 exported eggs and egg products with a value of 297 million euros. At the same time, the EU-27 imported eggs and egg products with a value of 21 million euros.

EU legislation
In the EU, egg producers have to comply with European legislation. This legislation deals with environmental protection, animal welfare and food safety. In 2021 the additional costs of EU legislation were estimated to be 14% of the total production costs of eggs at farm level. In these calculations the following legislation was taken into account:

- *Environmental protection*
  Nitrates directive to protect land and water and the reduction of ammonia emissions to protect air.
- *Food safety*
  Reduction of Salmonella prevalence, restricted use of meat and bone meal in poultry feed and regulations on GMO feed ingredients.
- *Animal welfare*
  Minimum standards on space allowance and legislation on beak trimming.

An important EU law causing an increase in production costs is Council Directive 1999/74/EC 'welfare of laying hens', which was implemented in 2012 on EU egg laying farms. The move from conventional cages to enriched cages led to a 5% costs increase.

The legislation on environment, animal welfare and food safety is less stringent in non-EU countries than in the EU.

In the EU farmers are keeping hens in four different systems. In 2021, 46% of the laying hens were in enriched cage, 36% in barn systems, 12% in free range systems and 6% was organic. Production costs of barn eggs and free range eggs are 15 and 35% higher, respectively compared to enriched cages.

Welfare legislation in non-EU countries
In the countries outside the EU illustrated in this report only the USA has a voluntary programme to increase the space allowance per hen in a cage system. In 2021 around 70% of the hens in the USA were kept in the conventional cage system, which was banned in the EU from 1 January 2012. Argentina, India and Ukraine don't have legislation on laying-hen welfare, and hens are kept in conventional cages with a space allowance of 400 to 450 cm^2 per hen. Between countries, regions and farms, the density can change due to expected market prices (high density when high egg prices are expected), climate (lower density in hot areas) and housing systems (open or climate-controlled houses). American literature shows that purely from an economic point of view, 350 to 400 cm^2 per hen in a conventional cage gives the lowest production costs (Bell, 2000).

Production costs in 2021 within the EU

The production costs of shell eggs produced in enriched cages have been calculated for eight EU countries: the Netherlands, Germany, France, Spain, Italy, Denmark, Poland and Hungary. Between these main egg-producing countries, the production costs of shell eggs in 2021 ranged from 100.6 eurocents per kg of eggs in Germany to 96.4 in Poland. The average for those eight countries is 98.5 eurocents per kg, based on production in enriched cages. The total production costs for whole egg powder also differ within the EU countries from 615 eurocents per kg of egg powder in Germany to 571 eurocents per kg in Poland. The EU average for production costs of whole egg powder based on cage eggs was 595 eurocents per kg.

Production costs in 2021 in non-EU countries

Compared to the average level within the EU, the cost of production for shell eggs in 2021 was lower in USA (-21%), Ukraine (-19%), India (-15%) and Argentina (-14%). As a result of the costs of transportation, import levies and also the effects on product quality and food safety, there are barely any imports of shell eggs from those countries to the EU. For whole egg powder the non-EU countries are more competitive. Compared to the average level within the EU (enriched cages), the production costs of whole egg powder from traditional cages in 2021 were lower in USA (-19%), Ukraine (-17%), India (-15%) and Argentina (-12%). Because the costs of transportation of powder are low (10 to 30 eurocents per kg), the offer price of whole egg powder from third countries is relatively low. However, current import levies protect the EU from large quantities of imports from the illustrated non-EU countries.

Comparison with earlier studies

This study is an update of two earlier reports with base years 2015 (van Horne and Bondt, 2017) and 2017 (van Horne, 2019). Comparison of the production costs of eggs at farm level in this study with the results for 2017 shows that the costs in the EU and all non-EU countries increased. The production costs calculated in euros increased, mainly as a result of higher feed prices. Figure 6.1 gives the production costs of cage eggs at farm level in 2010, 2013, 2015, 2017 and 2021 in the EU, USA, Ukraine, Argentina and India. The graph illustrates the USA had the lowest production costs in 2017 and 2021. The difference in production costs between the EU and the USA, Ukraine and Argentina was similar in 2017 and 2021. India had a smaller increase in production costs in 2021, which increased the difference with the EU.

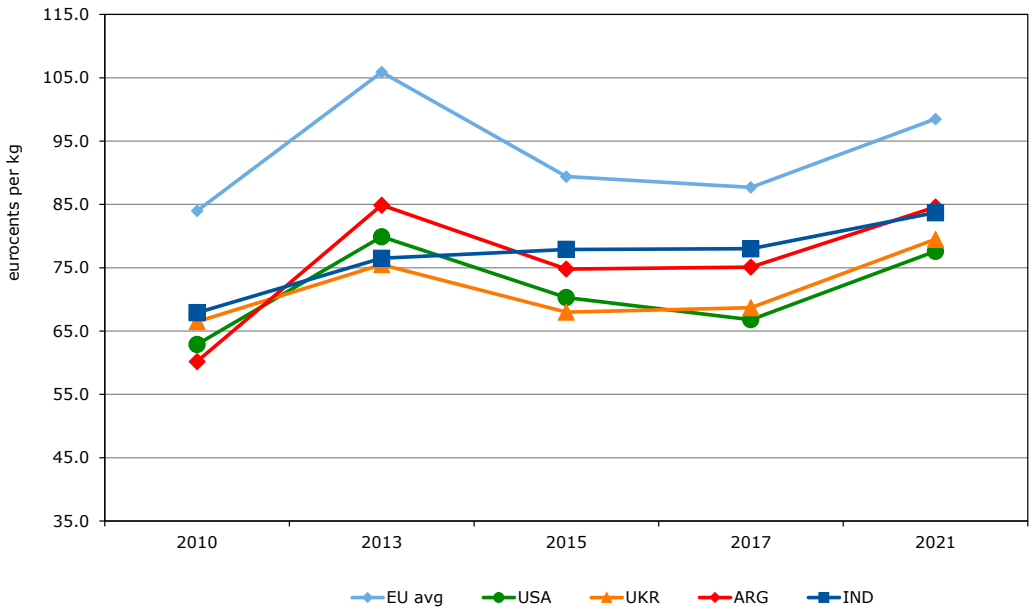

Figure 6.1 *Production costs of eggs at farm level (eurocents per kg eggs) in 2010, 2013, 2015, 2017 and 2021 in the EU, United States (USA), Ukraine (UKR), Argentina (ARG) and India (IND)*

Scenarios

To show the impact of a possible change in import levies and a change in exchange rate on the competitiveness of the EU egg sector, four scenarios were developed. In the first scenario, 50% lower import levies on eggs and egg products was taken as an example to illustrate the impact of any multi- or bilateral agreement with lower import levies. The results show that in this scenario Ukraine and the USA have a lower offer price of whole egg powder compared to the EU egg sector.

In the second scenario with a 10% lower exchange rate only the price of whole egg powder from the USA and Ukraine would be lower than the average EU level. In the third scenario with a combination of 50% lower import levies and a 10% lower exchange rate, all non-EU countries would be very cheap suppliers of whole egg powder to the EU market. This is also the case in scenario 4, in which the import levies are totally removed and there is a 10% lower exchange rate of all non-EU countries.

Sources and literature

Literature

Aarnink, A.J.A. and H.H. Ellen, 2008. 'Processes and factors affecting dust emissions from livestock production'. In: *Dust Conf 2007*. *How to improve air quality*. International conference, 23-24.4,2008, Maastricht, The Netherlands.

ADAS, 2016. Comparison of the Regulatory Framework and key Practices in the Poultry Meat Supply Chain in the EU and USA. Study by ADAS UK Ltd in conjunction with the University of Arkansas. UK, 2016.

Backus, G.B.C, P. Berkhout, D. Eaton, L. Franke, A.J de Kleijn, B. Lotz, E.M. van Mil, P. Roza and W. Uffelman, 2008. *EU policy on GMOs: a quick scan of the economic consequences*. Report 2008-070. The Hague: LEI.

Bell, D.B. December 31 2000. *Economic implications of reducing cage density in the U.S*. Cooperative Extension of the University of California. An economic update, number 234.

Bracke, M. et al. September 2009. *Animal Welfare in a Global Perspective*. Report 240. Lelystad: Wageningen UR Livestock Research. The Netherlands.

Chotteau, Ph., N. Beaumond, C. Deblitz, R. Hoste, P. Magdelaine, A. Mottet, K. De Roest, C. Roguet, P. Sarzeaud, M. Topliff and P. Van Horne, 2009. *The impact of increased operating costs on meat livestock in the EU*. Study for the European Parliament. Paris, Institut de l'Elevage. www.europarl.europa.eu/RegData/etudes/etudes/join/2009/419109/IPOL-AGRI_ET(2009)419109_EN.pdf

European Commission, 2022. Eggs Dashboard. https://agriculture.ec.europa.eu/system/files/2022-11/eggs-dashboard_en_1.pdf

European Commission, 2022. EU market situation for Eggs. Committee for the Common organisation of the Agricultural Markets. European Commission, Brussels, February 2022

European Commission, 2022. EU market situation for Eggs. Committee for the Common organisation of the Agricultural Markets. European Commission, Brussels, October 2022

Eurostat, data 2016 https://ec.europa.eu/eurostat/en/; online data code: EF_LSK_POULTRY

Horne, P.L.M. van, C.P.A. van Wagenberg, M.A. de Winter, R. Hoste, S.I. Senesi, M.M. Barilatti, M. Daziano, L.D.C. Martino and M.M.T. Becerra, 2010. *The poultry and pig sector in Argentina: husbandry practice and animal welfare.* The Hague: LEI Wageningen UR.

Horne, P.L.M van and N. Bondt, 2017. *Competitiveness of the EU egg sector*. International comparison base year 2015. Report 2017-062. The Hague: LEI Wageningen UR.

Horne, P.L.M, 2019. *Competitiveness of the EU egg sector, base year 2017*. International comparison of production costs. Report 2019-008. Wageningen Economic Research. Wageningen, February 2019.

IEC, 2018. Journal 31. *International Egg market*. Annual review. London: International Egg Commission.

IEC, 2022. *International Egg market*. Annual review on data. London: International Egg Commission.

Lichter, J. and Kleibrink, J. 2016. Comparison of production standards World - Germany ('Geflügelwirtschaft weltweit - Deutschland im internationalen vergeleich. Eine analyse der erzeugungsstandards'). Handelsblatt Research Institute. Düsseldorf, Germany.

MEG, 2022. Marktbilanz Eier und Geflügel. Eugen Ulmer Verlag, Stuttgart. Germany, June 2022.

UBA, September 2009. *Animal welfare: Argentina as a stakeholder*. Report: Layers. School of Agronomy. University of Buenos Aires.

Wagenberg, C.P.A. van, F.M. Brouwer, R. Hoste and M.L. Rau, 2012. *Comparative analysis of EU standards in food safety, environment, animal welfare and other non-trade concerns with some selected countries*. European Union. LEI Wageningen UR. www.europarl.europa.eu/RegData/etudes/etudes/join/2012/474542/IPOL-AGRI_ET(2012)474542_EN.pdf

Data sources

The basic data for calculating the production costs were obtained from several organisations, institutes and companies in the countries. For some countries data are from the International Egg Commission annual report (IEC, 2022). Feed prices of some countries are given by Marktbilanz Eier und Geflügel (MEG, Germany, June 2022). The following are the main sources per country:

Netherlands	Wageningen Economic Research
France	Institut Technique de l'Aviculture (ITAVI)
Spain	Asociacion Espanola de Productores de Huevos (ASEPHRU)
Italy	Vito Mastrangelo, consultant / Cascina Italia – Gruppo Moretti
Poland	Wageningen Economic Research, based on several sources
Denmark	Danish Egg Association
Hungary	Adel Erdos, Institute of Agricultural Economics (AKI) Dr. Laszlo Szollosi, University of Debrecen
Ukraine	Wageningen Economic Research, based on several sources
USA	Egg Industry Center at Iowa State University
Argentina	Wageningen Economic Research, based on several sources School of Agronomy of the University of Buenos Aires (UBA)
India	National Egg Co-ordination Committee (NECC)

Appendix 1 Development of the currency exchange rate

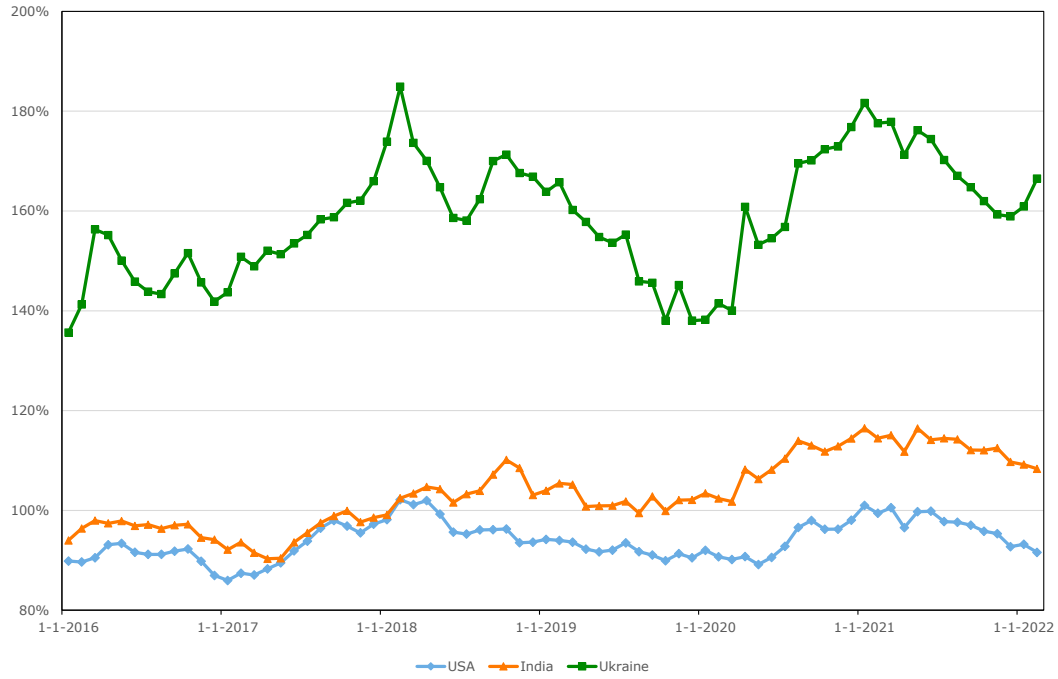

Figure A1.1 *Development of the exchange rate of the currencies of Ukraine, the USA and India against the euro (January 2015 = 100%; source: EC-website)*

Figure A1.1 shows that a change in exchange rate of 10% (scenario 2) or more can be a realistic scenario. For example in 2020, the exchange rates of all currencies increased against the euro (i.e. more foreign valuta for 1 euro). A higher exchange rate of the currency results in a lower offer price of egg products of these countries in Europe.

Table A1.1 gives the average exchange rates to the euro in 2021, which were used to calculate the production costs for 2021 (local currency in euros). Furthermore, the average exchange rates in 2020 and the ratio 2021/2020 are given.

Table A1.1 *Average value foreign valuta per unit in euro in 2022 and 2021 and the ratio 2021/2020*

Country	2020	2021	2021/2020
Ukraine	0.033	0.031	93%
India	0.012	0.011	96%
USA	0.880	0.841	96%
Argentina	0.013	0.009	71%

Appendix 2 EU imports of eggs and egg products

The EU is an importer of eggs and egg products. In recent years these import mainly came from USA, Argentina, India and Ukraine. Table A2.1 gives the amount imported from 2017-2021 from the most important third countries.

Table A2.1 *EU Imports of eggs and egg products (in tonnes egg equivalent) from third countries*

	2017	2018	2019	2020	2021	2022 (-Aug)
Ukraine	3,041	13,792	12,640	13,479	8,231	13,172
USA	10,919	5,656	4,463	4,667	3,412	781
China	256	342	708	1,348	886	na
north Macedonia	674	685	558	455	453	na
Argentina	na	1,939	1,366	1,825	1,940	2,298
India	na	62	0	0	98	1,081

Source: European Commission, February 2022.

Figure A2.1 gives an overview of the import of eggs and egg products from the main competitors Argentina, USA and Ukraine. This figure shows that the amount of import from a specific country fluctuates between years. Imports from Ukraine strongly decreased in 2021. Imports from USA further decreased to less than 4,000 tonnes in 2021. Imports from Argentina remained at around 2,000 tonnes. Table A2.1 also give the number for 2022 till august. In 2022 we see an increase of import from Ukraine and India.

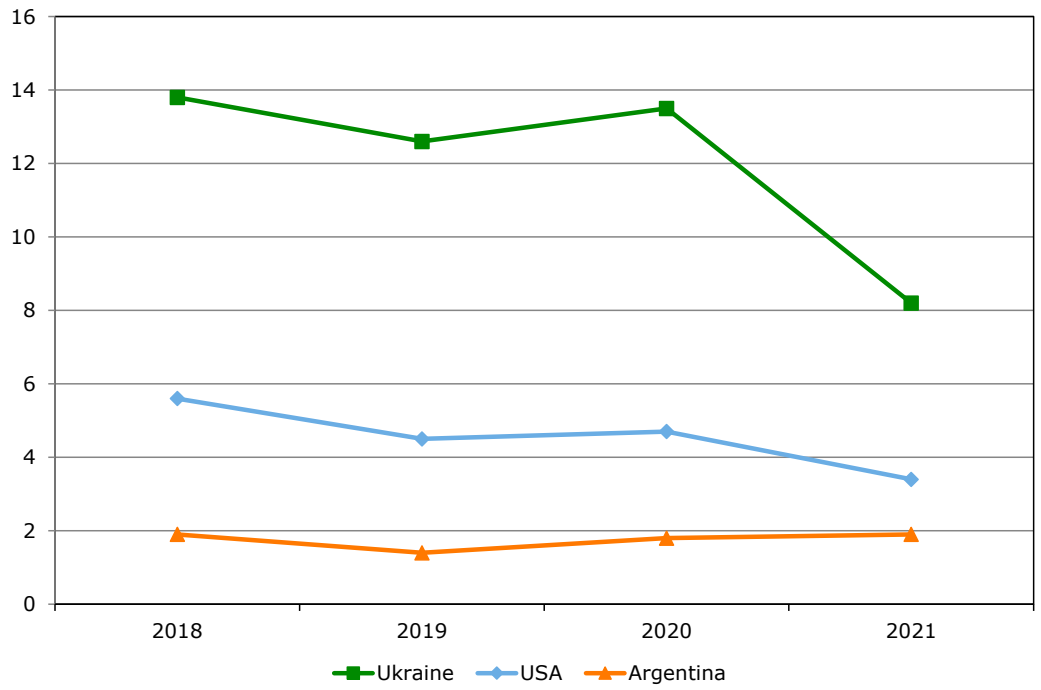

Figure A2.1 *Import into EU of eggs and egg products (in 1,000 tonnes of egg equivalent)*
Source: European Commission, EU market situation for Eggs October 2022, adaptation Wageningen Economic Research.

Appendix 3 Main assumptions in different housing systems for layers

Table A3.1 *Main assumptions for labour and investments in housing systems for laying hens*

	Conventional cage	Enriched cage	Barn/Aviary	Free range	Organic
Labour:					
Number of hens per worker	75,000	70,000	40,000	25,000	13,000
Buildings:					
Density (hen per m^2)	35	30	18	18	12
Surface area per house (gross m^2)	2,336	2,531	2,302	1,429	1,123
Investment:					
Housing (euro per hen housed)	7.32	8.50	13.53	13.43	20.31
Inventory (euro per hen housed)	11.95	16.80	17.50	17.50	28.00

Table A3.2 *Main assumptions for the production results in housing systems for laying hens*

	Conventional cage	Enriched cage	Barn/Aviary	Free range	Organic
Laying period (days)	490	490	490	462	462
Eggs per hen housed (number)	438	438	428	397	397
Feed consumption/hen/day (gram)	110	112	118	122	123
Egg production per hen housed (kg)	26.7	26.7	25.9	23.8	23.8

Appendix 4 Overview of EU import levies (€/1,000) and quotas (1,000 kg) (2022)

Import quota and duties on eggs 2022

Third country	Code group	Reg /CN code 8-digit	Egg – egg product Poultry species	Quantity (tons)	Reduction Tariff rate €/tonne lowest	Reduction Tariff rate €/tonne highest	Initial duty amount €/tonne lowest	Initial duty amount €/tonne highest
Mexico R1362/00	09.1831	0407 00 19	Poultry eggs not hatching	300		50%	35/ 1,000p	
Mexico R1362/00	09.1832	0408 1180, 0408 1981/9, 0408 9180 0408 9980	Egg Yellow	1,000 egg equi		50%	1.423 620 663 1374 353	
	09.1875	04081180 yolks dried				50%		
	09.1877	04081981 yolks liquid 0408 19 89 yolks other				50%		
	09.1879	04089180 not in shel dried				50%		
	091881	04089980 not in shell other				50%		
Mexico R1362/00	09.1869	3502 1190 35021990	Albumine	3,000 egg equi		100%	1,235 167	
	09.1883	3502119010 (dried crystals)				100%		
	09.1885	3502119090 (dried other)				100%		
	09.1887	35021990 (other than dried)				100%		
GATT/WTO	09.0154	0407 21 00 0407 29 10 0407 90 10	Egg fresh/preserved	114 669		152€ /t		304
GATT/WTO	09.4401	0408 1180, 0408 1981 0408 1989, 0408 9180 0408 9980	Egg yolk - dried Egg yolk - liquid Egg yolk -, other Not in shell, dried Not in shell - cooked	7,000 (*egg shell equiv)*		711 310 331 687 176		1,423 620 663 1,374 353
GATT/WTO	09.4402	3502 1190, 3502 1990	Albumin dried, Albumin other	15,500 *(egg shell equiv*)		617 83		1,235 167

Third country	Code group	Reg /CN code 8-digit	Egg – egg product Poultry species	Quantity (tons)	Reduction Tariff rate €/tonne		Initial duty amount €/tonne	
					lowest	highest	lowest	highest
Ukraine	09.4275	Reg 1308/2013 R2020/761	Several codes 0407, 0408 and 3502 0407 21 00, 0407 29 10, 0407 90 10, 0408 11 80, 0408 19 81, 0408 19 89, 0408 91 80, 0408 99 80, 3502 11 90, 3502 19 90, 3502 20 91, 3502 20 99	2100 in 2018 increasing to 3000 in 2021 (egg equiv)		100%		
Ukraine	09.4276	R2020/761	0407 2100, 0407 2910/9010	3,000 (net weight)		100%		
Ukraine	…….	R2022/780	All eggs and eggproducts	As from 05-06-2022 no import tariffs for 1 year		100%		
CANADA		CETA	Full Tariffs for a line of -0407 and 0408 codes					
Canada D037/17		35021190 35021990			100%			
Japan D1907/18		PM						
Vietnam R1024/20	09.8200	0408 11 80 00 0408 19 81 00 0408 19 89 00 0408 91 80 00 0408 99 80 00		500				
Vietnam D0753/20		35021190			77.187/100kg			
Vietnam D0753/20		35021990			10.437/100kg			
Singapore D1875/19		35021190			41.16/100kg			
Singapore D1875/19		35021990			5.56/100kg			
Mercosur	??	0408 11 80, 0408 19 81, 0408 19 89, 0408 91 80 0408 99 80.		500 in yr 1 Increasing to 3,000 in yr 5				
		3502 11 90 3502 19 90	Albumin	500 in yr 1 Increasing to 3,000 in yr 5				
EPA (??)			All goods except those mentioned in one of the annexes			100%		
GSP (Developing countries)			All goods except those mentioned in one of the annexes			100%		

Check: European Commission Taxation and Customs Union - Taric Consultation website
http://ec.europa.eu/taxation_customs/dds2/taric/taric_consultation.jsp?Lang=en

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The mission of Wageningen University & Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 7,200 employees (6,400 fte) and 13,200 students and over 150,000 participants to WUR's Life Long Learning, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.